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EPA Superfund
Record of Decision:

PAOLI RAIL YARD
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Paoli Rail Yard Superfund Site Paoli, Chester County, Pennsylvania

DECLARATION

Site Name and Location

Paoli Rail Yard
Paoli, Pennsylvania

Statement of Basis and Purpose

This decision document presents the final selected remedial action for the Paoli Rail Yard Site in Paoli, Pennsylvania, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 ("CERCLA"), 42 U.S.C. SS 9601 et seq., and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This decision document explains the factual and legal basis for selecting the remedies for this Site.

The Commonwealth of Pennsylvania concurs with the selected remedies. The information supporting this remedial action selection decision is contained in the Administrative Record for the Site.

Assessment of the Site

Pursuant to duly delegated authority, I hereby determine, pursuant to Section 106 of CERCLA, 42 U.S.C. S 9606, that actual or threatened releases of hazardous substances from this Site, as discussed in the Summary of Site Risks, if not addressed by implementing the response actions selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedies

These are the only planned response actions for the Site. These remedies address both ground water remediation and source control of soils, sediments, and buildings and structures contaminated with PCBs, and considered to be a principal threat.

The selected remedies includes the following major components:

- Excavation and on-site treatment of 28,000 cubic yards of contaminated rail yard soils using a solidification/stabilization process for soils with PCB concentrations exceeding 25 parts per million ("ppm"). The treated soil would be placed back on the rail yard in a containment cell. Long-term ground water monitoring would be required in the immediate vicinity of the containment cell;

- Erosion and sedimentation controls to manage and control storm water runoff and sediment from the rail yard;

- Deed restrictions on the rail yard will be developed to protect the integrity of the remedy and will prohibit use of the property for residential or agricultural purposes and to prohibit the use of on-site ground water for domestic purposes;

- Decontamination of buildings and structures on the rail yard property to minimize exposure to persons working on the Site. This would involve decontaminating approximately 35,000 square feet of high contact surfaces in the car shop buildings having PCB concentrations in excess of 10 ug/100 cm[2]. Depending on the type of surface, decontamination would be accomplished by wiping with a solvent, applying a chemical foam, shot blasting, or similar methods;

- Excavation and treatment of PCB-contaminated residential soils. The cleanup standard is to achieve an average PCB concentration of 2 ppm for each individual property. Excavated soil would be returned to rail yard property and treated using the solidification/stabilization process;

- Pumping of ground water contaminated with fuel oil at the rail yard using extraction wells, fuel oil recovery, ground water treatment using filtration and activated carbon, and discharge of the treated ground water on-site through a subsurface infiltration gallery. The recovered fuel oil is disposed off-site at an approved RCRA facility. This remedial alternative is currently being implemented;

- Long-term ground water monitoring to evaluate the effectiveness of the ground water pumping and treatment system and fuel oil recovery system;

- Excavation and treatment of stream sediments along North Valley Creek, Hollow Creek, and Cedar Hollow Creek (all tributaries to Little Valley Creek) and Little Valley Creek and Valley Creek with PCB concentrations exceeding 1 ppm. Contaminated sediments would be returned to the rail yard and treated using solidification/stabilization. Adverse impacts to the stream(s) and surrounding area shall be mitigated to the maximum extent practicable.

Statutory Determinations

The selected remedies are protective of human health and the environment; comply with Federal and State requirements that are applicable or relevant and appropriate to the remedial action; or a waiver can be justified for any Federal and State applicable or relevant and appropriate requirement that will not be met; and is cost-effective. These remedies utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable, and satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because these remedies will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of remedial action and every five years thereafter, as required by Section 121(c) of CERCLA, 42 U.S.C. S 9621(c), to ensure that the remedies provide adequate protection of human health and the environment.

RECORD OF DECISION
PAOLI RAIL YARD

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Paoli Rail Yard
Paoli, Pennsylvania

I. SITE NAME, BACKGROUND AND DESCRIPTION

Paoli Rail Yard
Paoli, Chester County, Pennsylvania

The Paoli Rail Yard Site ("the Site") is located north of the town of Paoli, in Chester County, Pennsylvania. The Site includes the 28 acre rail yard and the surrounding 400-acre watershed. The rail yard is bordered by Central Avenue to the north (and several private residential properties), North Valley Road to the east, the AMTRAK Harrisburg line to the south and the turnaround track to the west. A residential area lies to the north of the Site and a commercial development to the south. Lancaster Avenue (US Rt. 30) is south of the rail yard and is the main street of Paoli. The watershed includes threetributaries (Cedar Hollow, Hollow and North Valley) to Little Valley Creek and Valley Creek (Refer to Figure 1 and 2).

The Site is located in both Willistown and Tredyffrin Townships. The town of Paoli has a population of 6,100. The population of Willistown Township is 8,710 and of Tredyffrin Township is 26,690. The Site is zoned commercial.

The Paoli Rail Yard Study Area ("the study area") is primarily comprised of wooded and open parcels of land and residential properties to the north of the rail yard, and light commercial zones to the south of the rail yard (Refer to Figure 3). Three tributaries, which roughly parallel Cedar Hollow, Hollow, and North Valley Roads, emerge between 500 and 1000 feet north of the rail yard, flow north, and discharge into Little Valley Creek. Stream investigations were conducted in the three tributaries and in Little Valley and Valley Creeks. Prior to the installation of erosion control systems along the northern portion of the rail yard in 1986-1987, Hollow Road and Hollow Tributary formed a predominant erosion and drainage pathway from the rail yard. PCB contaminated soil eroded off the rail yard property through this and other drainage pathways into the nearby residential community and streams.

Most of the rail yard is covered with fill materials consisting of cinder, ash, and minor building debris in a clayey silt matrix at depths of about two feet. The underlying native soil is a loamy silty soil and silty soil. With increasing depth, the amount of schist fragments increases consistent with the saprolitic origin of these soils.

Ground water monitoring wells installed during the remedial investigation (RI) indicate ground water occurs at depths of 35 to 50 feet below the surface. Soil extends approximately 20 feet below the surface and bedrock the remaining depth below the soil. During the RI it was determined that fuel oil from leaking underground fuel oil transfer lines migrated vertically downward through the soil and through approximately 10 feet of unsaturated bedrock before collecting on the water table within the bedrock aquifer. During the RI it was determined that this 10 foot zone of unsaturated bedrock has been contaminated with fuel oil. A ground water divide is believed to exist immediately south of the rail yard in the east west direction. Ground water flow from the rail yard is toward the residential neighborhood north of the rail yard.

The majority of homes within the immediate vicinity north of the rail yard use private water supply and are serviced by Philadelphia Suburban Water Company. The Malvern Public Water Supply well field is located approximately 1.5 miles southwest of the rail yard. Three private water supply wells are located approximately 1/4 mile from the rail yard along Hollow Road.

The rail yard itself is enclosed by a fence and access is limited. The rail yard includes three main structures and five distinct track areas. The buildings include the car shop, power house and freight house. The study of PCB contamination has concentrated on the car shop, where rail cars are repaired. The track areas include a staging area for commuter trains, the car shop entrance and exit, the Harrisburg rail line, and the turnaround track.

The rail yard dates to 1915, when the car shop was built. The shop was designed to repair passenger rail cars, which were steam-powered at the time. The rail lines were later converted to electrical power at which time mineral oil was used to cool the transformers in the trains. In the 1950's, PCBs replaced the mineral oil in the transformers. Although operational records are limited, it appears that maintenance and repair practices at the rail yard resulted in the PCB soil contamination. PCBs in railroad transformers are released during servicing and volatilize during overheating in operation. For example, Westinghouse Electric Corporation has indicated that as much as 30percent of the dielectric fluid of a railroad transformer can leak before the unit fails (see Federal Register, January 3, 1983, page 128). Much of the PCB-contaminated soil is located in the rail yard track area where rail cars were operated.

Ownership of the rail yard has changed several times since 1915. The yard is now owned by the National Railroad Passenger Corporation ("Amtrak") and is operated by the Southeastern Pennsylvania Transportation Authority ("SEPTA"). The yard was originally owned and operated by the Pennsylvania Railroad. When the Pennsylvania Railroad and the New York Central Railroad merged in 1968, the yard was operated by the new Penn Central Transportation Company ("PCTC"). Amtrak took ownership of the rail yard during the bankruptcy reorganization of PCTC in 1976. Conrail operated the yard, during Amtrak ownership, from 1976 until 1982 when SEPTA took over operations.

The Paoli rail yard is used for storage and maintenance of passenger rail cars. The tracks leading to the car shop run along the northern portion of the property and extend through the car shop. The rail yard is accessed by workers from Central Avenue. The car shop tracks are separated from the Harrisburg Rail Line to the south by an elevated strip of land. The Harrisburg Rail Line is used for passenger and freight transportation. The southernmost section of track is referred to as the turnaround track, which is used to transfer rail cars between the car shop and the Harrisburg Rail Line.

In December 1991, EPA was notified that SEPTA had decided to discontinue all rail car maintenance and storage activities at the Paoli rail yard by June 30, 1994. After that time the rail yard will be closed. The rail yard and area immediately surrounding are zoned commercial. Land use North of the rail yard is residential.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

EPA initially became aware of the PCB contamination at the Site as a result of investigations conducted pursuant to the Agency's authority under the Toxic Substances Control Act (TSCA), 15 U.S.C. SS 2601 to 2671. Information received from the rail companies in response to TSCA subpoenas issued in 1985 revealed that extremely elevated levels of PCBs were present onsite. As a result, the United States and the rail companies, SEPTA, Amtrak, and Conrail, have entered into five (5) separate Consent Decrees ("CDs") which addressed various clean-up activities and worker protection measures at the Site and in the surrounding community.

Under the first CD entered in February 1986, the rail companies installed a security fence and a geotextile fabric fence around the perimeter of the Site. At this time, EPA conducted some offsite soil sampling, and restricted access to the Site. Sampling results revealed elevated levels of PCB contamination offsite.

The rail companies then undertook an engineering study under the second CD which addressed erosion, sedimentation, and storm water characteristics and control, at and from the facility and its immediate surroundings. In September 1986, subsequent to a hearing before Judge Scirica, in the United States District Court for the Eastern District of Pennsylvania at which EPA sought emergency access to the Site, EPA commenced construction of sedimentation and erosion control facilities including storm water collection basins A (western basin), B (central basin), and C (eastern basin), and associated drainage facilities. EPA remained onsite for a period of approximately two years, until June 1988.

Under the third CD the rail companies performed a Remedial Investigation/Feasibility Study ("RI/FS") for the Site. As part of this CD, the United States and the defendants entered into a worker-protection stipulation which addressed contamination inside the Paoli car shop. The stipulation called for, among other things, decontamination of specific areas in the car shop and implementation of a routine maintenance program for particular areas including the lunchroom, locker room ("clean-side/worker-side" lockers; laundry service), offices and other work storage areas.

The fourth CD, entered in November 1987, called for soil sampling in the residential areas immediately north of the Paoli rail yard (the "residential area") and the surface water channels extending north of the rail yard, up to, and including Little Valley Creek. Sampling results revealed elevated levels of PCBs in some of the residences adjacent to the Site.

As a result of PCBs discovered in nearby residences, the rail companies entered into a fifth CD in September 1988. Under this CD, the rail companies excavated 3500 cubic yards of contaminated soil from 35 residences directly north of the rail yard. The excavated properties were restored to original condition prior to the excavation.

On September 26, 1983, SEPTA, independent of any CDs, initiated the first phase of a rail car transformer retro-fill program that continued through August 1984. The second phase of the retro-fill program began in November 1985 and continued through July 1986. This retro-fill program was implemented in response to

TSCA regulations at 40 C.F.R. S 761 which require retro-fill programs to replace PCB fluids with other coolants. Prior to the July 1, 1979, records on the handling of PCB transformer fluids were not required to be maintained by TSCA regulations. Thus, there are few records regarding earlier time periods.

As to previous EPA actions at the Site, EPA has performed the following off-site response actions. In March 1986, EPA placed a tarpaulin over approximately 10,000 square feet of soil in the backyard of 100 Central Avenue using a geo-textile fabric. In October 1986, EPA initiated a removal action which included the excavation of 671 cubic yards of off-site soils in the vicinity 100, 96, 90, and 84 Central Avenue and 15 Minor Avenue.

This document is the first and final Record of Decision (ROD) for the Site; it will address all components of the remedies.

III. COMMUNITY RELATIONS

Throughout the Site's history, community concern and involvement have been high. EPA has kept the community and other interested parties apprised of the Site activities through informational meetings, fact sheets, press releases and public meetings.

A Community Relations Plan for the Paoli Rail Yard Site was finalized in April 1991. This document lists contacts and interested parties throughout government and the local community. It also established communication pathways to ensure timely dissemination of pertinent information. The PRPs' draft Remedial Investigation/Risk Assessment (RI/RA) and Feasibility Study (FS) reports, EPA's baseline risk assessment, and the Proposed Plan were released to the public in March 1992. All of these documents were made available in both the Administrative Record located in the EPA Public Reading Room in Region III and at the Paoli Public Library. A public comment period was held from March 15, 1992 to April 15, 1992, and extended to May 15, 1992. In addition, a public meeting was held on March 24, 1992, to discuss the results of the RI/RA and FS and the preferred alternative as presented in the Proposed Plan for the Site. Notice of the Proposed Plan and public meeting was published in the Philadelphia Inquirer. All comments received by EPA prior to the end of the public comment period, including those expressed verbally at the public meeting, are addressed in the Responsiveness Summary attached to this Record of Decision.

IV. SCOPE AND ROLE OF THE REMEDIAL ACTION

Three Potentially Responsible Parties (PRPs) - SEPTA, Amtrak, and Conrail - conducted an RI/RA and FS at the Site under the supervision of EPA pursuant to an administrative order by consent signed by the PRPs and EPA in 1987. The RI/RA and FS consisted of investigations and studies to characterize the type and extent of contamination in the entire study area and to develop alternatives to address the contamination problems.

The remedies selected in this ROD are the only planned response actions for this Site. The remedial action objectives are as follows:

- Source control of rail yard soil contaminated with PCB concentrations above 25 parts per million (ppm) to prevent exposure through direct contact.
- Decontamination of buildings and structures on the rail yard property to minimize exposure of persons working on the Site.
- Excavation of residential soils contaminated with PCBs to prevent exposure through direct contact.
- Recovery of fuel oil and entrained PCBs from the ground water in the vicinity of the rail yard car shop building and treatment of ground water.
- Excavation of sediments in streams and tributaries to provide adequate protection of human health and the environment.

V. SUMMARY OF SITE CHARACTERISTICS AND EXTENT OF CONTAMINATION

The environmental media characterized during the RI included soil, ground water, air, surface water, stream sediment, building surfaces, and aquatic organisms. The investigation focused primarily on the drainage and erosion areas where PCBs were deposited. Detailed discussions concerning the extent of contamination are presented in Chapter 3 of the RI/RA report.

The principal contaminant of concern at the Site is PCBs. PCBs were detected in rail yard soils, residential soils, stream sediments, and fish. PCBs were not detected in ground water outside of the vicinity of the car shop and were determined to be present below the level of quantification in wells containing fuel oil, probably due to cross contamination with the fuel oil which is known to mobilize PCBs. Fuel oil which previously leaked into the ground near the repair shop on the north side of the rail yard does contain PCBs and elevated levels of benzene, toluene, ethylbenzene, and xylene (BTEX). Benzene has been detected at concentrations in ground water that exceed Maximum Contaminant Levels ("MCLs") under the Safe Drinking Water Act ("SDWA"), 42 U.S.C. SS 300f-300j and the regulations at 40 C.F.R. S 141.61. BTEX compounds are contaminants of concern at this Site.

Erosion of PCB-contaminated soil from the rail yard to residential soil and to tributaries of Little Valley Creek and Valley Creek prior to 1986 when sediment erosion control measures were put in place is the most significant pathway for movement of PCBs (Refer to Figure 4). In general, a marked pattern of decreasing PCB contamination in stream tributary sediments is evident with increasing distance from the rail yard.

The concentration of PCBs detected in residential soil and stream sediments is approximately three orders of magnitude lower than the PCB concentration in the rail yard. PCBs were not detected in surface water and ground water but PCBs were determined to be present in the fuel oil. The fuel oil has contaminated the subsurface soil and has migrated into the fractures of the bedrock above the water table in the vicinity of the car shop building.

Table 1 shows the range of PCB concentration for selected media.

Surface Water Hydrology

As previously mentioned, there are three tributaries (located parallel to Cedar Hollow, Hollow, and North Valley Roads) which discharge to Little Valley Creek. The headwaters to the Cedar Hollow Road (CHR) Tributary emanate approximately 1400 feet northwest of Central Avenue along Cedar Hollow Road. The headwaters to the Hollow Road (HR) Tributary emanate approximately 450 feet north of Central Avenue along Hollow Road, and the headwaters to the North Valley Road (NVR) Tributary emanate approximately 900 feet north of Central Avenue along North Valley Road.

During RI sampling, eighteen surface water samples collected from the three tributaries to Little Valley Creek and 15 samples collected from Little Valley and Valley Creeks were analyzed for PCBs. Two rounds of samples were collected; one before and one after a rain event. PCBs were detected at a maximum concentration of 1.8 parts per billion (ppb) at the headwaters of CHR tributary. PCBs were not detected in any other surface water samples (Refer to Figures 5 and 6).

A topographic high located south of the rail yard marks the southern edge of a surface water divide for the drainage basin associated with the rail yard. Precipitation that falls on any portion of the rail yard would have its surface water movement limited to areas immediately to the north of the rail yard including the three tributaries that receive surface drainage from the rail yard. Prior to the yard installation of erosion control systems along the northern perimeter of the rail yard, a study was performed by Groundwater Technology Inc. ("GTI"), on behalf of the Rail Companies, that showed surface water flowed primarily via sheet flow to the north. The document runoff outlet and sediment loss pathway was along Hollow Road which drained the central portion of the rail yard and North Valley Road which drained the eastern portion of the rail yard.

Surface drainage patterns were altered in 1986 by the installation of erosion control features along the northern perimeter of the rail yard. These features include the installation of an anchored sedimentation control fence (utilizing high strength, woven, UV resistant fabric) and sedimentation basins. Rail yard surface water continues to be controlled by these techniques.

<u>Cedar Hollow Road Tributary</u>

The approximate elevation at the headwaters of the CHR Tributary is 405 feet above mean sea level. The tributary flows northwest approximately 625 feet along the west side of Cedar Hollow Road before it is channeled underground through a drainage pipe adjacent to an industrial park. The CHR Tributary bottom consists primarily of weathered schist fragments with lesser amounts of silty sand in depositional areas. The CHR Tributary ranges from 5 to 6 feet wide and 2 to 4 inches deep (depth of water).

The drainage pipe extends approximately 500 feet to the northwest before the tributary resurfaces along the east side of Cedar Hollow Road. The elevation of the tributary where it resurfaces at the end of the drainage pipe is 310 feet. From this point, the CHR Tributary flows approximately 1625 feet to the north through woods and fields until it joins Hollow Road (HR) Tributary. The bottom sediments in this section consist primarily of clayey silts to gravelly sands and this section is 3 to 5 feet wide and 2 to 4 inches deep.

From this point where HR Tributary merges with CHR Tributary, the tributary flows north approximately 1100 feet before it flows into Little Creek. The average slope of this segment is 0.02. The bottom sediments in this section of CHR Tributary consist primarily of clayey silts to gravelly sands and the tributary is 3 to 5 feet wide and 2 to 4 inches deep.

Based on estimations of surface flow velocity measurements obtained during the RI from three sampling stations set at upstream, mid-stream and downstream locations in Cedar Hollow Road Tributary, the surface flow velocity is estimated to range from 1.3 to 1.8 feet/second.

Hollow Road Tributary

The approximate elevation at the headwaters of HR Tributary which begins at the end of Hollow Road is 460 feet. The HR Tributary is steepest for the first 1000 feet as it flows to the northwest. The bottom sediments consist primarily of weathered schist fragments with some sandy silt that accumulates in small pool deposits. This section of the tributary is 3 feet wide and 2 to 3 inches deep.

HR Tributary continues approximately 2400 feet to the northwest before its confluence with CHR Tributary. The average slope of this section of the HR Tributary is 0.07. The bottom sediments consist primarily of clayey silts to silty sands and the tributary is 3 to 5 feet wide and 3 to 6 inches deep. Based on an estimate from a single surface velocity measurement at a sampling station in HR Tributary, the flow velocity is 0.6 feet/second.

North Valley Road Tributary

The approximate elevation at the headwaters of NVR Tributary, which flows along the west side of North Valley Road, is 450 feet. The NVR Tributary is the steepest for the first 940 feet as it flows to the north-northwest. The average slope of the NVR Tributary is 0.10 in this section. The bottom sediments consist of weathered schist fragments with lesser amounts of sandy silt that accumulates in small depositional areas. The tributary is 3 feet wide and 3 to 6 inches deep.

NVR Tributary continues approximately 2,250 feet to the north before it is channeled underground through a concrete drainage pipe. The drainage pipe extends approximately 500 feet to the north. The distance from the point where the tributary resurfaces at the northern end of the drainage pipe to the point where NVR Tributary converges with Little Valley Creek is approximately 1000 feet. The average slope of the NVR Tributary along the total distance of 3,750 feet is 0.05. The bottom sediments consist of clayey silts to gravelly sands, and the tributary is 3 to 4.5 feet wide and 0 to 11 inches deep. The NVR Tributary was dry in many locations, and where water flowed, stream obstructions prevented measurement of surface flow velocity.

Little Valley Creek and Valley Creek

Little Valley Creek flows from west to east, nearly perpendicular to the three tributaries. HR and CHR Tributaries meet approximately 1100 feet upstream of their confluence with Little Valley Creek. The elevation of Little Valley Creek at its confluence with CHR Tributary is 200 feet. The Little Valley Creek measures about 2500 feet between its confluence with CHR Tributary and its confluence with NVR Tributary. The slope of Little Valley Creek along this section is 0.008. The elevation of Little Valley Creek at its confluence with NVR Tributary is 180 feet. Little Valley Creek spans a distance of about 7000 feet from its confluence with NVR Tributary northeast to its confluence with Valley Creek. The slope of Little Valley Creek in this section is 0.007. The elevation at its confluence of Little Valley Creek with Valley Creek is about 130 feet. Valley creek ultimately discharges into the Schuylkill River, approximately 6.5 miles northeast of the rail yard.

The three tributaries that parallel Cedar Hollow, Hollow, and North Valley Roads are narrow, shallow, and steep, when compared with Little Valley Creek and Valley Creek. Recreational use of the three tributaries is minimal. The tributaries are not physically suited for swimming or fishing, however, fishing in Little Valley Creek and Valley Creek does occur. Although these creeks are not sufficiently deep for swimming, people may wade in the creeks.

According to Pennsylvania Water Quality Standards, Valley Creek is designated a trout-stocking stream under Chapter 93 of the Pennsylvania Code, Title 25. There are no Pennsylvania stream designations for the tributaries. There is currently a ban on fish consumption in Valley Creek and fishing is on a catch-and-release basis.

Site Hydrogeology

A total of 25 monitoring wells were installed and monitored during the remedial investigation. This study showed that a ground water divide, located south of the rail yard, follows a northeast-southwest topographic ridge that separates ground water movement from the rail yard from the ground water basin to the south of the rail yard. To the south of the rail yard, a physical discontinuity (a ridge line) exists between ground water occurrence from the Paoli rail yard from other ground water basins in a southerly direction. This ridge line, located immediately south of the rail yard, parallels Route 30 in an east/west direction.

Geology

The rail yard and study area are located within the Piedmont Upland Section of the Piedmont Province. The Piedmont Uplands formed from uplifting which resulted in high-angle faulting and formation of folded anticlines. An understanding of this geology is critically important to study area modelling and ground water flow predictions.

The rail yard is underlain by the Precambrian to lower Paleozoic aged Wissahickon Formation. The Wissahickon Formation is a medium to coarse-grained, phyllitic schist consisting primarily of quartz, feldspar, muscovite, and chlorite. The estimated thickness of the Wissahickon Formation in the vicinity of the study area is 8,000 to 10,000 feet. The general geologic structure (trend and lineation) of the bedrock tends to follow east-northeast to west-southwest patterns with nearly vertical planes of schistosity. The subsurface's geologic structure evidences itself as ridge lines that form ground water and surface divides.

The topography overlying the local geology is characterized as undulating hills of medium relief; natural slopes are moderately steep and stable. The nature of the metamorphic bedrock is such that differential weathering of the bedrock has produced a generally deep subsurface profile ranging from silt loams soil to saprolite (low permeability weathered rock) at depth. Regionally, the saprolite thickness ranges from 15 to 25 feet and is distributed in a blanket-like manner. This deep soil and saprolite sequence has a substantial attenuating effect on the infiltration of chemicals and their subsequent movement in the subsurface.

The Wissahickon Formation crops out in several locations within the study area, particularly in the vicinity of the turnaround track and north of the Site along Cedar Hollow Road. The medium-grained, muscovite-rich, phyllitic schist exposed at the rail yard and along Cedar Hollow Road exhibits vertically to subvertically-dipping schistocity layers. The schistocity layers (trend) strike N65 E and are vertical to near vertical with a dip of schistosity at 80 to 90 to the south. The planes of schistocity (layers) are closely-spaced and fractured. These schistose layers are highly weathered along these zones as indicated by the friable nature of the weathered bedrock and iron oxidation coatings along the schistosity. The weathering and healing process was observed to greatly impede fluids movement. Some quartz replacement was observed along the schistose layers. A poorly developed subtle joint set was also measured at the outcrops. The joint set strikes N5 E and dips approximately 40 to the east. Joints are randomly spaced three to five feet apart. Each joint is narrow, tight and does not exhibit the degree of iron oxidation or quartz replacement seen along the schistosity layers. No movement of fluids was observed along these subtle poorly developed joints.

The bedrock at the extreme north of the study area (approximately ½ mile) is described as the Conestoga Formation. The Lower Ordovician-aged Conestoga Formation consists of thin-bedded medium gray, impure limestone with black, graphite shale partings, and conglomeratic at base. The total thickness of the Conestoga Formation is unknown, but is at least 300 feet thick. The topography of this area is characterized by rolling valleys and hills of low relief and natural slopes that are gentle and stable. This geologic sequence also tends to produce a silty clay, low permeable, soil cover that overlies bedrock.

<u>Rail Yard Soils</u>

The Paoli Rail Yard is best characterized as fill located on top of a soil sequence known as the Glenelg channery silt loam which, when undisturbed, has a 3% to 8% slope and is moderately eroded. The Glenelg Series is capable of moderate soil moisture and is moderately fertile. The typical Glenelg Series soil profile consists of a horizon of dark-brown to very gray-brown channery silt to gritty silt loam with sub-angular blocky structure, partial clay films on beds, and firm consistency. The undisturbed soil sequence generally has a zone at a depth of alluviated (accumulated) silts and clays which greatly restrict downward movement of water, metals and organics.

The northern portion of the study area is located within the Hagerstown-Conestoga-Guthrie soil association which consists of several silt loam series including the Conestoga, Hagerstown, Bedford, Hollinger, Guthrie, and Lawrence silt loams.

Most of the area of the rail yard (28 acres) is covered with fill materials consisting of cinder, ash and minor building debris in a clayey silt matrix. The cinder/silt matrix was accumulated during previous coal-powered operations on the rail yard. This layer of ash and cinder is predominantly restricted to the upper few feet of the rail yard. This fill sequence has been found to be quite unique, consisting of a general silt clay matrix of low permeability (10[-5] to 10[-6] cm/sec), and with a relative high carbon content (greater than 5%) and laced with the honeycomb-like cinder ash. The combined effect of the silt/clay-organic carbon and ash/cinder matrix from field investigations evidences it to be a sponge-like trap for oils and other fluids. Below the fill material in most areas, the natural soil profile extends vertically downward to native decomposed bedrock fragments.

Both surface soil samples and soil borings were collected on the rail yard during the RI using a systematic sampling program to determine the lateral and vertical extent of PCBs. Approximately 200 surface soil samples were also collected during the RI. The maximum detected PCB concentration was 6000 ppm. A PCB isoconcentration map (Figure 1-9 in the FS) shows the concentration of PCBs using surface soil sampling data. The map shows that the highest PCB concentration closely follows the rail track area and decreases rapidly outside of the immediate track area.

Based on the soil borings completed at the rail yard, the lateral and vertical extent of the fill material has been determined. In most of the track areas on the rail yard, the top one to three feet of fill consists of ballast, cinder and silts. It should be noted that much of this ballast at the Paoli Rail Yard is not a true stone ballast but consists of large cinder pieces accumulated during coal-powered operations at the rail yard. In two areas: (1) east and west of the car shop, and (2) the vicinity of storm water basin C, the fill thickness ranges from approximately three to six feet and consists primarily of cinder and silt. In an area north of the car shop, the fill thickness ranges from six to seventeen feet and consists primarily of cinder, silt, and minor building debris. In this location, the original soil profile has been disturbed. The natural soils on the rail yard have a permeability in the 10[-5] to 10[-6] cm/sec range.

<u>Residential Soils</u>

During the RI soils were sampled in the nearby residential area north of the rail yard using a combined systematic and judgmental sampling program. Soil samples were collected from residential yards, residential gardens and play areas, and along road drainage features.

Over 400 samples were collected using a tiered sampling protocol identified in the RI as Level I, II, III, and IV. Level I included residential and commercial properties located topographically downgradient of the rail yard where contaminated sediment was most likely to be deposited through erosion and runoff. Composite samples were collected from front yards, back yards, and gardens. Level II included residential properties located topographically upgradient of the rail yard that would not directly receive runoff from the rail yard. Front yard composite samples were collected from every fourth residential property, as well as surface soil samples from gardens. Level III consisted of collection of biased grab samples from drainage features along roads, drainage channels on residential properties (including Level I and II areas) and along tributaries. The purpose of this sampling was to determine direct surface runoff pathways. Level IV sampling consisted of random composite samples that were taken through the entire 400 -acre study area.

The maximum PCB concentration for the front and back yard composite samples was 21 ppm PCB. The maximum PCB composite concentration reported for flower garden and vegetable garden soil samples was 25 ppm. Approximately 35 properties have composite samples that exceed 5 ppm PCBs, either in front or back yards or in soil from gardens. The maximum drainage sample detected was 28 ppm PCB. The previous residential soil removal programs were intended to excavate surface soils with a PCB concentration exceeding 50 ppm. None of the additional sampling conducted during the RI detected surface soil samples with PCB concentration exceeding 50 ppm.

Regional Hydrogeology

The ground water basin associated with the study area is in the Wissahickon Formation. Available regional information was complied to compare regional and site-specific aquifer characteristics. On a regional basis, the Wissahickon Formation is capable of storing and transmitting ground water from precipitation that has infiltrated downward through soil and into bedrock through secondary low porosity features such as fractures, faults, joints, and relict bedding planes. A lineament study in the region revealed the presence of two lineament trends. One trend strikes N0 - 10 W and the second trend strikes

N50 - 60 W. Neither of these trends evidence themselves on the study area in outcrop exposures or in cuttings from the wells constructed.

Depending on topography, the water table in the Wissahickon Formation may occur in saprolitic soil (generally in valleys and low-lying areas) or in fractured bedrock (generally on hilltops and medium-relief hillsides). The wells in the Wissahickon Formation that are located on hills have significantly lower yields than wells located in valleys. The hydraulic conductivity decreases with depth due to a decrease in fracturing and weathering with depth and due to healing of fractures as a result of overburden pressure and mineralization.

The Wissahickon Formation is generally a low permeability formation, yet occasionally it can exhibit a wide-range of aquifer characteristic values and be considered extremely heterogeneous and anisotropic. The storage coefficient in valley saprolitic soil averages 0.08. The storage coefficient in the upper 2,000 feet of the bedrock is typically 0.002. The storage coefficient in the upper 460 feet of the Wissahickon Formation has been estimated to range between 0.00007 and 0.0005 with a median value of 0.0003. The transmissivity (ability to transmit fluids) in the upper 460 feet of the Wissahickon Formation has been estimated to range between 540 and 14,000 gallons per day/per foot (gpd/ft) with a median value of 860 gpd/ft.

A physical discontinuity exists between the ground water that occurs south of the rail yard and that which exists beneath and north of the rail yard. This discontinuity exists in the form of a topographic ridge line that is developed over the underlying geologic structure which forms the ground water divide. The RI identified the presence of a ground water divide that is located to the south of the rail yard and follows a northeast-southwest trending topographic ridge. As noted previously, the trend of this divide follows the geologic structure of the foliation of the schist bedrock (dominant East/West trends with near vertical planes of schistosity). The presence of this topographic ridge and the foliation of the schist bedrock creates a divide which separates ground water movement from the rail yard (drains to the north) from the ground water basin to the south of the rail yard. The ridge line, located immediately south of the rail yard, parallels Route 30 in a general east/west direction. Its behavior as a ground water barrier/divide for north/south movement of ground water is confirmed by ground water liquid level measurements obtained from monitoring wells.

Ambient Air

During the remedial investigation, an ambient air investigation was performed at locations outside the car shop near areas with high PCB concentrations in soil and inside the car shop. The primary sources of PCBs for air migration are areas of exposed soil where elevated PCB concentrations have been reported. Four rounds of ambient air sampling were collected from three sampling stations and one background station and analyzed for PCBs. The background samples ranged from 0.004 to 0.097 ug/m[3]. Samples from the other three sampling stations ranged from 0.025 to 1.134 ug/m[3]. Air samples taken inside the car shop ranged from 0.38 to 0.72 ug/m[3]. The OSHA standard is 500 ug/m[3] (Refer to Figure 7).

<u>Car Shop</u>

A comprehensive investigation was performed during the RI to assess the distribution of PCBs within the car shop. The car shop is located in the northwestern section of the rail yard. The car shop is an active facility used primarily to repair and maintain rail cars. To determine the extent and concentrations of PCBs, surfaces within the car shop, including ceilings, walls, and permanent structures, were sampled. Cement and other core samples were also taken to determine the vertical extent of PCBs in the car shop. A total of 149 surface wipe samples were collected. PCBs were detected at concentrations ranging from undetected to 823 ug/100 cm[2]. In addition, 39 concrete core samples were taken ranging from 0-7 inch depth intervals in various locations throughout the car shop. Additionally, cores were completed through other porous surfaces. The highest PCB levels were detected in cement near the repair pits at concentrations ranging from 503 to 2345 ppm.

Ground Water

During the RI a hydrogeologic investigation was designed to evaluate the ground water quality and movement in the aquifer beneath the rail yard and the study area and determine the concentration of PCBs in ground water. A total of 25 monitoring wells were installed within the study area during the RI. As shown in Figures 8, 9, and 10, most of the wells were located in the vicinity of the rail yard car shop, but additional wells were installed in the commercial area south of the rail yard and north of the rail yard at the headwaters to Cedar Hollow, Hollow, and North Valley tributaries. Two rounds of samples were analyzed.

During the RI, water table elevation measurements were taken in the on-site wells; No. 2 fuel oil was detected in well 10 near the car shop building. In July 1990, a fuel oil recovery and ground water recovery system was installed at the rail yard and is currently in operation. This system recovers approximately 250 gallons of fuel oil annually. Two rounds of samples were analyzed for PCBs. Additional ground water samples were analyzed for total petroleum hydrocarbons, benzene, toluene, ethylbenzene and xylene (BTEX compounds). PCBs were not detected in ground water outside of the vicinity of the car shop and were determined to be present below the level of quantification in wells containing fuel oil, probably due to cross contamination with the fuel oil which is known to mobilize PCBs. The concentration of BTEX compounds reported in the RI ranged from 0.0037 ppm to 0.085 ppm and total petroleum hydrocarbons ranged from 0.036 to 0.87 ppm.

As part of the RI and in order to determine the extent and concentration of PCBs and fuel oil constituents in the subsurface soil profile, splitspoon samples were collected for PCBs and total petroleum hydrocarbon (TPH) quantification. In wells that did not contain phase-separate fuel oil, ground water was sampled and analyzed for PCBs, TPH, and benzene, toluene, ethylbenzene, and xylene (BTEX). A total of 25 soil borings were completed near the car shop and east of the area of the above-ground fuel oil tanks at a maximum depth of 20 feet. These borings were used to identify the lateral and vertical extent of affected soils in the area of concern. RI sampling results are highly variable in terms of the lateral and vertical extent of hydrocarbon contamination. The maximum levels of total petroleum hydrocarbons exceed 10,000 ppm.

Biota

A comprehensive investigation to characterize terrestrial and aquatic biota as well as investigate any wetland ecosystems within the study area was completed as part of the RI. Three categories of land uses have been established: residential/suburban, successional woodlands, and estate-type farms. A field reconnaissance was conducted to identify the dominant species of concern within each category. This investigation also identified fauna that may potentially migrate into, or otherwise enter, the area encompassing the RI study area. Fish samples were collected during the RI from a total of five stream stations. At each station three composite samples were collected. The first sample was a trout fillet composite, the second was a sucker fillet composite, and the third was a sucker whole grind composite. Benthic invertebrate samples were collected from Little Valley and Valley Creeks. Because no freshwater clams or snails were observed, worms (oligocheates) were selected as an alternate species. Worms were collected from a total of eight stations in Little Valley and Valley Creeks (Refer to Figures 11, 12, and 13).

A wetlands assessment was conducted in the study area as part of the RI. Wetland ecosystems are important for reducing flood hazards, reducing erosion and the situation of streams and rivers, providing habitats for plants and animals (including rare, threatened, and endangered species), and helping to maintain water quality by providing a natural filtration system for contaminants and suspended particles. The study area consisted of approximately 400 acres located in the Piedmont Uplands. An initial survey resulted in the division of the area into three major vegetation units: a forested slope unit, grassland unit, and a flood-plain forest unit. Within these units, eight wetland observation areas were chosen. Wetland inclusions occurred within all three units as narrow bands of riparian wetlands associated with the local water courses.

An area of wooded slope occurs immediately north of the rail yard, extending approximately a half-mile to a nearby level area that has previously been cleared for agricultural use and the installation of electric power transmission line towers. The Cedar Hollow, Hollow, and North Valley road tributaries draining the rail yard carry surface water topographically downslope to the north in this area. Hydrologic indicators of wetland conditions were generally not encountered in the forested slope unit. An exception to this situation was found in an area between the Cedar Hollow and Hollow tributaries. An area of forested wetland resulting from a groundwater seep approximately mid-way downslope was encountered. Because the seep originates at midslope, it is not receiving surface drainage from the rail yard and, therefore, is not expected to be impacted by contamination.

Based on the results of the routine determination, the majority of the wooded slope unit is not a jurisdictional wetland. Neither the hydrotropic vegetation nor the wetland hydrology criterion are met. The wetland areas associated with the water courses in the forested slope unit are more limited than would be expected.

Downstream of the forested slope unit is an area of nearly level terrain approximately 500 feet wide which has been cleared of trees. It appears that the land was at one time used for agricultural purposes. The grassland unit now serves as an electrical transmission line right-of-way. The original forest vegetation has been replaced with cultivated grasses interspersed with herbaceous plants.

The three tributaries draining the rail yard traverse this area. Two wetland observation areas were chosen in the grassland unit: one adjacent to Hollow tributary and one adjacent to Cedar Hollow tributary. As a result of the greatly decreased slope relative to the wooded slope region, stream flow is significantly lessened in the grassland unit. Wetland vegetation associated with the water courses is readily apparent. Soils were inundated with several inches of water or were saturated for distances approximately 25 feet from the water channels.

While the grassland unit as a whole is not a wetland, wetland inclusions associated with the tributary flows have been identified by the presence of hydrophytic vegetation, hydric soils, and evidence of wetland hydrology. The riparian wetland zones associated with the tributaries in the grassland unit are more extensive than those observed in the wooded slope unit as a result of the decreased stream flows in the level terrain.

Floodplain forest can be found downstream of the grassland unit and extend approximately half a mile to Little Valley Creek. The floodplain forests are dominated by different environmental conditions. Hydrophytic vegetation criterion were not met. In several areas it was not possible to obtain a soil sample suitable for hydric soil determinations because the substrate was composed almost completely of fine schist material. No evidence of wetland hydrology was observed in the floodplain forest unit.

Flora and Fauna

Flora and fauna were characterized in the study area. In general, there is a mix of residential areas, estate-type farms/farmland, commercial/light industrial, and successional woodlands. Approximately fifty percent of the area along the tributaries between the rail yard and Little Valley Creek is comprised of residential/suburban development. Besides some light industrial parks bordering North Cedar Hollow Road, the remainder of the area is mostly successional woodland areas. The area along Little Valley Creek, bordered by the tributaries (from the Paoli Rail Yard) and Valley Creek, is almost exclusively estate-type farms, with patches of woodlands.

VI. SUMMARY OF SITE RISKS

Public Health Studies

In 1987, the Agency for Toxic Substances and Disease Registry (ATSDR) conducted an epidemiologic investigation to study the possible effects of PCB exposure on 89 persons living near the Paoli Rail Yard Site. Blood samples were collected from residents in the more contaminated areas adjacent to the rail yard and compared with a control group farther away and less likely to be exposed to PCBs. No statistically significant difference was observed between PCB blood serum levels in the control and the non-control group. Some of the persons tested living in the more contaminated areas also worked at the rail yard. Among the persons tested, age was the only variable that correlated well with serum PCB levels; the older the person, the higher the PCB blood serum levels.

EPA Risk Assessment

EPA prepared a baseline risk assessment (RA) for the Paoli Rail Yard Site in order to characterize the current and potential threats to human health and the environment and to quantify risks from PCBs. As part of the RI/RA, a baseline risk assessment was also prepared by GTI for SEPTA, Amtrak, and Conrail. EPA has chosen to rely primarily on its own human health and environmental risk assessment due to deficiencies in the risk assessment contained in the RI/RA. Table 2 provides a discussion of the key terms used in the risk assessment described in the ROD. The EPA risk assessment consisted of a toxicity assessment, an exposure assessment, and a risk characterization.

Current land zoning for the rail yard and the immediate vicinity surrounding the rail yard is commercial. Land use north of the Site beyond West Central Avenue is residential. According to local zoning ordinances and information received from Tredyffrin Township and Willistown Township, future land use for the rail yard will not be residential.

The risks to human health are quantified by using cancer potency factors (CPFs) for carcinogenic contaminants and reference doses for noncarcinogenic contaminants. CPFs have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of (mg/kg-day)-1 are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the incremental or excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Populations at risk include:

(1) Persons who may work at the rail yard now and in the future. The primary routes of exposure would be inadvertent ingestion and dermal absorption of PCBs by adults. The occupational setting may be either commercial or industrial.

(2) Persons who live in the residential area in the vicinity of the rail yard. The primary routes of exposure would be inadvertent ingestion and dermal absorption of PCBs by adults and children.

(3) Persons who consume fish from Little Valley Creek and Valley Creek contaminated with PCBs. The primary route of exposure would be ingestion.

Contaminants of Concern

Two primary contaminants of concern, PCBs and benzene, were selected in the ROD based upon their toxicity, mobility and persistence in the environment, and potential health risks. Because of the extremely high levels of PCBs detected at the rail yard (maximum of 6,000 ppm) and their carcinogenic potential, PCBs are a primary contaminant of concern and evaluated in the risk assessment. Concentrations of PCBs detected in the study area are shown in Table 1.

The specific contaminants of concern in the ground water are BTEX compounds (benzene, toluene, ethylbenzene, and xylene). Because benzene is a known human carcinogen and has been detected at concentrations in ground water that exceed the MCL established under the Safe Drinking Water Act, benzene was selected as a primary contaminant of concern. Benzene has been detected in the ground water at the rail yard in concentrations up to 11 ug/l. Ground water sampling results for PCBs were reported as laboratory values less than the reliable detection limit but possibly greater than zero. These values are below the quantification limit which is the lowest level at which a chemical can be accurately quantified.

Toxicity Assessment

Polychlorinated biphenyls, or PCBs, represent a class of 209 individual chlorinated hydrocarbon compounds that contain a variable number of substituted chlorine atoms on the biphenyl ring. PCBs are man-made chemicals and are classified as suspected human carcinogens based on scientific data from laboratory animals. The PCBs most frequently detected within the study area are Arochlor 1254 and 1260, with Arochlor predominantly detected. Benzene is classified as a human carcinogen based on epidemiological studies. Ethylbenzene, toluene and xylene are not classified as carcinogens.

Exposure Assessment

The EPA risk assessment identified potential exposure pathways for incidental soil ingestion and fish consumption. There are currently persons on-site at the rail yard who work in the train repair building car shop and in the rail yard. Some workers may be expected to remain on-site after the rail yard is closed for routine maintenance and other related work. If the future occupational setting is considered to be commercial rather than industrial, then office workers or other similar type workers in a commercial work place would be expected to come in contact with contaminated soil and dust. There are children and adults who reside in the area closest to the rail yard and will be exposed to soil containing PCBs. PCBs were also detected in fish in nearby Little Valley Creek and Valley Creek. The following exposure routes involving the designated population were considered in EPA's baseline risk assessment. Exposure assumptions are documented in the EPA "Risk Assessment Guidance for Superfund: Human Health Evaluation Manual" and the supplemental guidance "Standard Default Exposure Factors" (OSWER Directive 9285.6-03).

Extensive sampling has been conducted of PCB concentration in soil at the rail yard and in the residential community. PCB concentrations in rail yard soil in the vicinity of the car shop and high use track areas are in the range of 1,000 to 6,000 ppm PCBs. Because of earlier cleanup operation and excavation of the residential neighborhood, PCB concentrations in residential soil, as of 1989, are in the range of less than 1 ppm to approximately 20 ppm.

1) Ingestion of contaminated soils from the rail yard

The exposure pathway for rail yard soils is based on ingestion of PCB contaminated soil for an adult who works in a commercial/industrial setting for 5 days a week for 50 weeks per year (250 days total) for a period of 25 years. Adults are assumed to be routinely exposed to contaminated soil or dust, and exposure is assumed to be lower than under an industrial scenario. This exposure scenario is considered reasonable based on current use and future expected use which may be a commercial setting.

2) Ingestion of contaminated soils from the residential area

The exposure scenario for residential soils is based on frequent, repeated contact with contaminated soils by both children and adults since children play in the area and both inhalation and ingestion of PCB contaminated soil may be considered likely to occur. The exposure scenario assumes a year round exposure to PCB of 350 days/year and EPA guidance specifies a combined soil and dust ingestion rate of 200 mg/day for children (6 years of exposure) and 100 mg/day for adults.

3) Consumption of fish

This exposure pathway is considered relevant because PCB contamination at the rail yard has impacted Little Valley and Valley Creeks which supply a consistent supply of trout and other edible fish. A ban on fish consumption is now in effect as discussed in the ROD. An exposure scenario of 0.054 kg/meal for a 30 year duration has been assumed.

4) Inhalation of contaminated air

This exposure scenario considers the risk for adults at the rail yard and for adults and children (combined exposure) in the residential neighborhood immediately adjacent to the rail yard based on inhalation of particulates which are contaminated with PCBs. EPA has employed the model of Cowherd, et. al. using EPA guidance document "Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites" (EPA/600/8-85/002, February, 1985. The assumptions used to calculate a chronic daily impact (CDI) for persons working at the rail yard include a PCB inhalation rate of 0.83 m[3]/hour, an exposure time of 8 hours/day, and exposure frequency of 250 days/year for 25 years.

5) Ground Water

No risk assessment was performed as part of the PRP RI/RA nor as part of the EPA risk assessment, since no evidence existed that contaminants of concern in the ground water have migrated off-site of the rail yard. In addition, residents in the area are supplied with public drinking water. EPA has recently become aware of three residential dwellings downgradient of the rail yard which may still be using ground water for drinking purposes. As part of the remedial design phase of the remediation, EPA intends to conduct sampling and analysis of these wells and will take appropriate action to minimize any health endangerment if any level of contaminant were to exceed Agency action levels.

Table 3 contains a summary of the assumptions used in the baseline risk assessment.

Risk Characterization

The baseline risk assessment conducted by EPA evaluated the potential carcinogenic risks posed by PCBs in the various exposure media. Potential human health problems from PCB exposure are identified by calculating the carcinogenic risk level. For example, a 1 x 10[-6] level indicates one additional chance in one million that an individual will develop cancer above the expected normal rate of 250,000 in one million. Remedial action is generally warranted when the calculated additional carcinogenic risk level exceeds 1 x 10[-4], meaning that more than one or more additional persons out of 10,000 is at risk of developing cancer caused by a lifetime exposure to PCBs.

The incremental cancer risk from the exposure scenarios described above were calculated as follows:

Persons who work at the Rail Yard-The lifetime excess cancer risk associated with exposure from ingestion of PCBs in soil for persons who work at the rail yard based on current levels of PCB contaminated soil is in the range of 1.6 x 10[-3] to 2.3 x 10[-3]. Excavation and treatment of soils with a PCB concentration of 25 ppm or greater will reduce the risk to a 3.5 x 10[-5] incremental cancer risk level. The lifetime excess cancer risk from inhalation of PCB-contaminated particles based on current conditions is 2.8 x 10[-4].

Residential Adults and Children-The lifetime excess cancer risk associated with exposure to PCBs in residential soil based on current conditions is 5.5 x 10[-5] for children and 1.7 x 10[-5] for adults. For residential exposure, a PCB concentration of 2 ppm approximates a 10[-5] incremental cancer risk level for children and for adults. The lifetime excess cancer risk from inhalation of PCB-contaminated particles based on current conditions is 5.6 x10[-5].

Environmental Risks

The PCB levels in sediments in the three tributaries to Little Valley Creek (CHR, HR, and NVR), Little Valley Creek, and Valley Creek were reviewed relative to the ecological effects and environmental risks using field data and information of toxicity of PCBs from the literature. PCBs were generally not detected in surface water with the detection limit used in the RI/RA. Based on data from the RI/RA, PCBs were detected in sediments in the three tributaries to Little Valley Creek at levels exceeding 10 ppm, ranged from undetected to 1.9 ppm in Little Valley Creek, and undected to less than 1 ppm in Valley Creek. EPA believes that these levels may change over time due to sediment transport and that additional baseline sampling will be necessary immediately prior to remediation.

The environmental risk associated with these levels of PCBs in sediments is expected to be of concern because (1) the contaminated areas provide habitat resources for wildlife; (2) PCB concentrations in sediment exceed concentrations at which toxic effects to aquatic organisms have been observed; and (3) bioconcentration of PCBs can occur directly through exposure to contaminated sediment and water or indirectly through consumption of aquatic organisms.

In assessing environmental risk, EPA did not rely on the conclusions of the RI/RA report because the Agency believes the technical conclusions of the RI/RA were limited in scope, and because the "weight-of-evidence" on PCB toxicity from the literature was not considered in the RI/RA and is necessary to evaluate environmental risks. In particular, EPA has relied on information from the scientific literature in the Administrative Record (see "A Discussion of PCB Target Levels in Aquatic Sediments" by L.J. Field and R.N. Dexter), and information in the Administrative Record from the Pennsylvania Fish Commission and U.S. Department of Interior which recommend a cleanup standard of 1 ppm PCBs in sediment. The publication entitled "A Discussion of PCB Target Levels in Aquatic Sediments" generally supports a target sediment level in the range of 0.1 to 1.0 ppm based on bioaccumulation and toxicity data. The actual cleanup standard must take into account the characteristics of the contaminated area and the potential environmental impacts of the remediation activity. The 1 ppm cleanup standard is considered a protective, quantifiable level by State and Federal regulatory agencies which can be achieved without significant adverse effects upon the aquatic system.

There is no documentation of federal endangered species within the immediate study area. However, Valley Forge National Park, through which Valley Creek flows, is possibly home for three Pennsylvania endangered species of bird - the bald eagle, peregrine falcon, and osprey. A number of other threatened or imperiled bird species in Pennsylvania have been sighted in the park.

Valley Creek contains a self-sustaining trout population and is classified as a cold water fishery. The Pennsylvania Fish Commission has categorized the creek as a Class A trout stream, the highest stream class recognized in the state. Some of the more common species of fish present in Valley Creek are brown trout, white sucker, rock bass, smallmouth bass, and bluegill.

PCB levels in fish from Valley Creek have historically exceeded the Food and Drug Administration (FDA) level for human consumption of 2 parts per million ("ppm") [see 21 C.F.R. S 109.30]. An analysis in 1986 by Pennsylvania DER of brown trout taken from Valley Creek inside Valley Forge National Park indicated PCB levels of 2.8 and 4.5 ppm (whole trout) and 2.7 and 3.7 ppm (trout fillets). In 1989, Pennsylvania DER reported PCB levels in brown trout fillets at 2.5 ppm in Valley Creek and 2.8 ppm in Little Valley Creek. These PCB concentrations exceed the levels reported in the RI/RA report. Based on 18 fish samples collected from Little Valley and Valley Creeks during the RI, the average PCB concentration in trout fillets was 0.9 ppm, 1.26 ppm in sucker fillets, and 2.74 ppm in whole suckers.

EPA's baseline risk assessment for trout fillets and sucker fillets downstream of the Site indicates an incremental cancer risk of 1.1 x 10[-3] to 1.6 x 10[-3] for fish consumption. Consumption of fish from Valley Creek is prohibited under State law and fishing is allowed only on a catch-and-release basis.

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

VII. REMEDIAL ACTION OBJECTIVES

Soil and Sediments

The remedial action objective is source control of contaminated soils and sediments to protect human health and the environment from exposure through direct contact and incidental ingestion. This objective will be accomplished through excavation and treatment of soils and sediments that represent a principal threat and exceed risk based action levels and cleanup standards.

The Paoli Rail Yard is currently zoned for commercial land use but land use may be currently characterized as industrial. After rail yard activities are suspended in 1994, the land used will be non-residential based on current and projected future zoning requirements. Residential use will be prohibited through institutional controls. EPA has chosen an action level of 25 ppm PCBs for the rail yard based on the Agency's risk assessment. That action level is also consistent with EPA's "Guidance on Remedial Actions for Superfund Sites with PCB contamination" (OSWER Directive No. 9355.4-01, August,1990 which recommends an action level in the range of 10 to 25 ppm for industrial sites). The remedial action objective of excavation and treatment of soil with PCBs exceeding 25 ppm will achieve an incremental cancer risk level of 3.5 x 10[-5]. This action level is protective of human health and the environment and will be consistent with future land use. EPA believes that for purposes of establishing cleanup standards it is not appropriate to treat the rail yard as a residential site in order to achieve a cleanup standard consistent with residential use.

The residential area adjacent to the rail yard has been contaminated with PCBs through erosion and soil deposition from the rail yard. Previous removal actions in the residential area excavated residential soils above 50 ppm PCBs. EPA has set a cleanup standard of 2 ppm for residential soils based on the Agency's risk assessment for exposure of children and adults to PCB-contaminated soil. An average PCB soil concentration of 2 ppm per individual property calculates to approximately a 1 x 10[-5] incremental cancer risk level. EPA believes this is a protective, quantifiable residual level for PCBs in residential soil.

Streams and tributaries in the study area will be excavated to achieve a cleanup standard of 1 ppm PCBs in sediments. This level is consistent with recommendations of the U.S. Department of the Interior (DOI), the Pennsylvania Fish Commission, and a compilation of technical documents published by the U.S. Department of Commerce, Ocean Assessments Division, entitled "A Discussion of PCB Target Levels in Aquatic Sediments". This level is consistent with EPA OSWER Directive No. 9355.4-01 entitled "Guidance on Remedial Actions for Superfund Sites with PCB Contamination," August 1990. The available chemical and environmental monitoring data from the study area, along with weight-of-evidence indicating that PCBs can bioaccumulate in the food chain and have adverse impacts on aquatic life at even lower concentrations in sediment, support using this standard.

In addition, EPA will require that additional stream studies be performed as part of the remedial action. These studies will ascertain the exact extent of contaminated stream corridor above the cleanup level.

Rail Yard Buildings and Structures

EPA requires that SEPTA employees continue to implement the worker protection program to minimize direct exposure to PCB contamination and incorporates that document into this Record of Decision. EPA has set a standard for decontamination of surfaces of the rail yard car shop and related buildings and structures containing PCBs in excess of 10 ug/100 cm[2] based on the PCB Spill Cleanup Policy (40 C.F.R. S 761.120) to protect site workers from direct exposure and contact with PCBs.

Ground Water

The ground water aquifer underneath the Paoli Rail Yard Site is classified as a Class IIA aquifer, a current source of drinking water. Ground water sampling results for PCBs were reported as laboratory values less than the reliable detection limit but possibly greater than zero. These values are below the quantification limit which is the lowest level at which a chemical can be accurately quantified. PCBs were reported below the level of quantification in wells containing fuel oil, probably due to cross contamination with the fuel oil which is known to have historically leaked into the ground water underneath the rail yard in the vicinity of the car shop may act to dissolve and carry PCBs into the ground water. Pumping of ground water contaminated with fuel oil, ground water treatment, and fuel oil recovery system is currently being implemented at the rail yard.

Benzene has been detected in ground water in the vicinity of the rail yard car shop building at levels that exceed the MCL. The source of the benzene is believed to be the fuel oil contamination. The maximum detected concentration for benzene is 11 ppb since the start of the ground water and fuel oil recovery system. The remedial action objective is to recover fuel oil to the maximum extent practicable and to restore contaminated ground water to the MCL for benzene (5 ug/l) as required under the Safe Drinking Water Act ("SDWA"), 42 U.S.C. SS 300f-300j and the regulations at 40 C.F.R. S 141.61, or to background concentration for benzene, whichever is more stringent. Thus, the currently on-going pump and treat remediation is incorporated into this ROD as a means of containing and removing the fuel oil contamination constituents.

VIII. DESCRIPTION OF ALTERNATIVES

A feasibility study (FS) was conducted to identify and evaluate remedial alternatives applicable to the scope and role of the response action based on effectiveness, implementability, and cost. Treatability studies were conducted on several technologies for treating PCBs in soil that measured the effectiveness of these technologies. The alternatives determined to be most applicable were then evaluated and compared to nine criteria required by the National Contingency Plan (NCP). The NCP requires a No Action alternative be evaluated as a point of comparison for other alternatives.

Treatability Study Results

As part of the FS, treatability studies were conducted on several technologies to demonstrate the viability of the technology, to determine whether the technology can reasonably be expected to meet cleanup standards for the Site, and to determine additional testing required for full-scale design. The treatment technologies evaluated were incineration, thermal desorption, KPEG dechlorination, DCR dechlorination, solvent extraction, stabilization/solidification, and bioremediation. As a result of the FS screening process, seven soil treatment options were retained for further evaluation using treatability studies. Bench-scale treatability studies were conducted using untreated soil from the rail yard on all of these technologies except incineration which is a proven technology for treatment of PCB contaminated wastes. The treated residual levels were compared against the equivalent performance standard of 2 ppm; other performance criteria were also evaluated. As described in OSWER Directive No. 9355.4-01 entitled "Guidance on Remedial Actions for Superfund Sites with PCB Contamination", August 1990, PCB-contaminated material can be treated by an alternative method provided that the treatment can achieve a level of performance equivalent to an incinerator or a high efficiency boiler. EPA guidance indicates that an equivalent level of performance for an alternate method of treatment of PCB-contaminated material is demonstrated if it reduces the level of PCBs to 2 ppm or less measured in the treated residual.

In summary, the technologies that proved to be most favorable were stabilization/solidification and KPEG dechlorination, although treatability studies indicated that the KPEG process would create material handling/operational difficulties. Thermal desorption and solvent extraction did not meet performance criteria. Thermal desorption also increased the leachability of metals from soil to the extent that Toxicity Concentration Leaching Procedure ("TCLP") test results showed that leachable lead in the treated soil exceeded the EPA regulatory level. Bioremediation was considered effective in treating total petroleum hydrocarbons in fuel oil but not PCBs. Results of the DCR process were never completed. The stabilization/solidification study was conducted using four different stabilizing agents to evaluate the physical stability of each. The TCLP results for both the untreated soil and the solidified material showed that PCB concentrations in the leachate was in the range of 1 to 3 ppb PCBs. The rail yard ash and cinder fill material also acts as a binder and aggregate for the solidified material.

Using results from the treatability studies, the KPEG process, incineration, and stabilization/ solidification, were retained for further analysis as source control technologies.

This ROD addresses five distinct areas of study for which each of the alternatives retained are described. These areas are segregated according to the breakdown shown below with sub-elements for some of the complex alternatives.

Rail Yard soil

1. No action
2. Institutional controls
3. Containment of contaminated soils
4. Excavation and on-site treatment of contaminated soils with PCB concentrations exceeding 500 ppm
5. Excavation and on-site treatment of contaminated soils with PCB concentrations exceeding 25 ppm
6. Excavation, on-site treatment of contaminated soils, and containment
7. Excavation and off-site disposal

Residential and other soil

1. No action
2. Excavation and treatment of residential soils
3. Groundwater treatment and fuel oil recovery

Rail Yard buildings and structures

1. No action
2. Containment or encapsulation
3. Decontamination
4. Decontamination and Demolition

Stream sediments

1. No action
2. Containment
3. Excavation and treatment of sediments with PCB Concentrations exceeding 10 ppm
4. Excavation and treatment of sediments with PCB concentrations exceeding 1 ppm

ALTERNATIVES FOR RAIL YARD SOIL

For each of the alternatives discussed for the rail yard soils it is envisioned that rail yard operations will have ceased at this location and rail tracks and ties would be removed and disposed of prior to construction of any of the remedies. Most of the areas of excavation are underneath the railroad tracks which are currently in use and, therefore, the tracks and ties must be removed. The tracks would be steam washed and sent to an off-site disposal or recycling facility. The railroad ties would be sent to an appropriate offsite disposal facility. Decontamination and disposal would meet TSCA requirements at 40 CFR 761.20(c) and 761.60(a).

Alternative 1--No Action

Capital Cost:	& 0
Annual O&M Costs:	$ 57,960
Present Worth Costs:	$546,431
Implementation Time frame:	None

The No Action alternative is considered in the detailed analysis to provide a baseline to which other remedial alternatives can be compared. This alternative would include no further action to remove, remediate or contain rail yard soils other than routine monitoring and maintenance activities. Because this alternative will result in contaminants remaining onsite, CERCLA S 121(c) requires that a Site review be conducted every 5 years to monitor the effectiveness of this alternative. This alternative could be implemented immediately. This alternative would not meet action-specific ARARs which require remediation or landfilling of soils greater than 50 ppm under the TSCA disposal requirements set forth at 40 C.F.R. S 761.60. There are no location-specific or chemical-specific ARARs for this alternative.

Alternative 2--Institutional Controls

Capital Cost:	$ 10,000
Annual O&M Costs:	$ 57,960
Present Worth Costs:	$556,431
Implementation Time frame:	None

Institutional controls would include deed restrictions to prohibit use of the property for residential or food growing purposes. Routine monitoring and maintenance activities would continue as described in Alternative 1. Because this alternative will result in contaminants remaining onsite, CERCLA S 121(c) requires that a Site review be conducted every 5 years to monitor the effectiveness of this alternative. This alternative could be implemented immediately. This alternative would not meet action-specific ARARs which require remediation or landfilling of soils greater than 50 ppm under the TSCA disposal requirements set forth at 40 C.F.R. S 761.60. There are no location-specific or chemical-specific ARARs for this alternative.

Alternative 3--Containment of Contaminated Soils

Capital Cost:	$10,331,485
Annual O&M Costs:	$ 103,250
Present Worth Costs:	$11,304,723
Implementation Time frame:	6 months

Under this alternative, a 12-inch soil cover or equivalent would be placed over approximately 15 acres of rail yard property having PCB concentrations in excess of 25 ppm. Clean soil would be used from off-site sources and the soil cover graded and suitably vegetated. Appropriate drainage structures would be constructed to control surface runoff from the area. Most of the areas identified as exceeding 25 ppm PCB concentration are in the vicinity of the railroad tracks. It is anticipated that in the northern portion of the Site where track areas are near residential properties along Central Avenue, the soil cover would extend to the rail yard Site boundary adjacent to the residential properties to ensure that contaminated areas are adequately contained and to prevent runoff onto residential properties.

Institutional controls would prohibit the Site for residential use as described in Alternative 2.

Because this alternative will result in contaminants remaining onsite, CERCLA 121(c) requires that a site review be conducted every 5 years to monitor the effectiveness of this alternative. Location-specific ARARs include the Pennsylvania Erosion Control Regulations, 25 PA Code SS 102.1102.5, SS 102.11-102.13, SS 102.22-102.24. This alternative would not meet action-specific ARARs which require remediation or landfilling of soils greater than 50 ppm under the TSCA disposal requirements set forth at 40 C.F.R. S 761.60. There are no chemical-specific ARARs for this alternative.

Alternatives 4A, 4B, 4C--Excavation and On-site Treatment of Contaminated Soils with PCB Concentrations Exceeding 500 ppm

Capital Cost:	$7,367,800 to $13,779,120
Annual O&M Costs:	$ 57,969 to $ 110,950
Present Worth Costs:	$8,413,620 to $14,324,450
Implementation Time frame:	6 months

These alternatives involve excavation and treatment of approximately 8,000 cubic yards of contaminated soil with PCB concentrations exceeding 500 ppm. A PCB concentration of 500 ppm represents an excess cancer risk between 10[-3] and 10[-4] based on worker exposure. Most of the areas of excavation are underneath the railroad tracks, requiring the tracks and ties be removed. The tracks will be steam washed and sent to an off-site disposal or recycling facility. The ties will also be sent to an off-site disposal facility. Testing of the railroad tracks for any remaining PCBs will occur after the steam washing process and before being sent to a recycle or disposal facility (other than an approved PCB waste disposal site) in accordance with 40 C.F.R. SS 761.20(c) and 761.60(a).

Three different soil treatment technologies that were retained and evaluated from the technology screening for treatment of contaminated soils are described below. Institutional controls would prohibit Site use for residential use as described in Alternative 2. Because these alternatives will result in contaminants remaining onsite, CERCLA S 121(c) requires that a Site review be conducted every 5 years to monitor the effectiveness of this alternative. PCBs alone are not a RCRA hazardous waste. The contaminated PCB soil is not a RCRA characteristic waste. PCB-contaminated soils are exempt from 40 CFR S 268 Land Disposal Restrictions by 40 CFR S 261.8. Therefore, the RCRA prohibition on land disposal of hazardous waste and RCRA closure requirements are not ARARs for this Site. Any waste material or product which may be generated during remediation activities, other than PCBs, which is determined to be a RCRA characteristic waste will be disposed in accordance with RCRA Subtitle C, Hazardous Waste Management Requirements, 40 C.F.R. Parts 262, 263 and 264.

The Pennsylvania Hazardous Waste Regulations, 25 PA Code Chapts. 260-264 do not apply since PCBs are not a State listed hazardous waste. Location-specific ARARs include the Pennsylvania Erosion Control Regulations, 25 PA Code S 102.1-102.5, S 102.11-102.13 and S 102.22-102.24. This alternative would not meet action-specific ARARs which require remediation or landfilling of soils greater than 50 ppm under the TSCA disposal requirements set forth at 40 C.F.R. S 761.60. Other action-specific ARARs include: TSCA, 40 C.F.R. S 761.20(c) relating to distribution of PCBs in commerce; the TSCA chemical waste landfill requirements, 40 C.F.R. S 761.75 with the exception of those management controls which are waived under CERCLA S 121(d)(4); and the Pennsylvania Air Pollution Control Act, 25 PA Code SS 123.1, 123.2, 123.41, 127.1, and 127.14. There are no chemical-specific ARARs for this alternative.

Alternative 4A - Excavation and On-site Treatment with Stabilization/Solidification:

Contaminated soil would be excavated, treated using a stabilization/solidification process, and placed back on-site in a containment cell. The excavated area would be backfilled with clean soil, graded to contour, and revegetated. Erosion control measures would be required during and after construction to manage and control storm water runoff in accordance with the State regulations. Stabilization/ solidification is a demonstrated treatment process that involves the mixing of contaminated soil with specific ratios of water, binder material, and other additives to modify the physical and chemical properties in such a manner to cause the contaminates to remain physically bonded to rigid aggregate mixture. This process binds the contaminants into a solid matrix which will immobilize the contaminants. A treatability study, utilizing this treatment process, was conducted during the FS which revealed that the stabilized material reduced the migration potential of PCBs. Despite immobilization, however, PCBs are still present in the waste and are not destroyed, requiring management controls to evaluate the long-term reliability of the process. No air emissions or wastewater discharge is expected from the process but air emissions could occur during handling of excavated soil. See the discussion of ARARs in Alternatives 4A, 4B and 4C, above, for those Federal and State laws that are applicable or relevant and appropriate to the remedy. The present worth cost is $8,413,620.

Alternative 4B - Excavation and On-site Treatment with KPEG Dechlorination:

Contaminated soil would be excavated and treated on-site with a reagent mixture in a tank. Chemical reagents prepared from polyethylene glycols and potassium hydroxide have been demonstrated to dechlorinate PCBs. The resulting treated slurry would be separated and the treated soil would be returned to the Site. The used chemical reagent would be recycled or disposed off-site by incineration in a RCRA facility if determined to be a RCRA waste. KPEG is a closed process and no air emissions or waste gases would be expected. Erosion control measures would be required during and after construction to manage and control storm water runoff in accordance with the State regulations.

A treatability study conducted during the FS indicated that this process will achieve a PCB concentration of 2 ppm in the treated soil. However, during the treatability study it was observed that large amounts of suspended particles were present in the decanted reagent and that separation and removal of these suspended particles would likely require special material separation equipment and probably result in problems in process operation which may render the process ineffective. See the discussion of ARARs in Alternatives 4A, 4B and 4C, above, for those Federal and State laws that are applicable or relevant and appropriate to the remedy. The present worth cost of this treatment option is $11,098,950.

Alternative 4C - Excavation and On-site Treatment with Incineration:

Incineration is a well demonstrated technology for treatment of PCBs. A mobile incinerator would be brought to the Site and the contaminated soil would be excavated and incinerated on-site to meet TSCA treatment requirements pursuant to 40 C.F.R. S 761.60(a). A trial burn would be required before implementing this alternative. Incineration technology has demonstrated greater than 99% destruction efficiency for PCBs. Waste incinerator gas would require treatment prior to discharge. Water from the incineration process would be treated off-site in a RCRA facility if required. Treatability studies conducted during the FS indicate that residual treated soil would be a RCRA characteristic waste based on TCLP analysis. Residual metals and ash would be solidified to meet RCRA land disposal treatment standards and placed on-site in a secure containment area. Erosion control measures would be required during and after construction to manage and control storm water runoff. See the discussion of ARARs in Alternatives 4A, 4B and 4C, above, for those Federal and State laws that are applicable or relevant and appropriate to the remedy. In addition, this alternative would meet action-specific ARARs regarding incineration set forth at 40 C.F.R. S 761.70 requiring incineration of PCBs greater than 50 ppm. The present worth cost of this treatment option is $14,325,450.

Alternatives 5A, 5B, and 5C--Excavation and On-site Treatment of Contaminated Soils with PCB Concentrations Exceeding 25 ppm

Capital Cost:	$18,204,275 to $29,165,600
Annual O&M Costs:	$ 0 to $ 138,250
Present Worth Costs:	$19,507,375 to $29,165,600
Implementation Time frame:	24 months

These alternatives involve excavation and treatment of approximately 28,000 cubic yards of contaminated soil with PCB concentrations exceeding 25 ppm, using one of the three treatment alternatives evaluated under alternative 4. A PCB concentration of 25 ppm represents approximately a 10^{-5} excess cancer risk based on worker exposure.

Most of the areas of excavation are underneath the railroad tracks, requiring the tracks and ties be removed. The tracks will be steam washed and sent to an off-site disposal or recycling facility. The ties will also be sent to an off-site disposal facility. Testing of the railroad tracks for any remaining PCBs will occur after the steam washing process and before being sent to a recycle or disposal facility (other than an approved PCB waste disposal site in accordance with 40 C.F.R. SS 761.20(c) and 761.60(a)).

Institutional controls would prohibit Site use for residential use as described in alternative 2. Under these alternatives, approximately 3000 cubic yards of soil from the residential soil removal program currently located on the rail yard property in a lined containment cell would also be treated.

Because these alternatives will result in contaminants remaining onsite, CERCLA 121(c) requires that a site review be conducted every 5 years to monitor the effectiveness of the alternative.

PCB-contaminated soils are exempt from 40 CFR 268 Land Disposal Restrictions by 40 CFR S 261.8 and are not a RCRA hazardous waste and therefore, the RCRA prohibition on land disposal of hazardous waste and RCRA closure requirements are not ARARs for this Site. Any waste material or product other than PCBs which may be generated during remediation activities and which is determined to be a RCRA characteristic waste will be disposed of in accordance with RCRA Subtitle C, Hazardous Waste Management Requirements, 40 C.F.R. Parts 262, 263 and 264. The Pennsylvania Hazardous Waste Regulations, 25 PA Code Chapt. 260-264 do not apply as PCBs are not a State listed hazardous waste. Location-specific ARARs include the Pennsylvania Erosion Control Regulations, 25 PA Code SS 102.1-102.5, 102.11-102.13 and 102.22-102.24. This alternative would meet action-specific ARARs which require remediation or landfilling of soils greater than 50 ppm under the TSCA disposal requirements set forth at 40 C.F.R. S 761.60. Other action-specific ARARs include: TSCA, 40 C.F.R. S 761.20(c) relating to distribution of PCBs in commerce; the TSCA chemical waste landfill requirements, 40 C.F.R. S 761.75 with the exception of those management controls which are waived under CERCLA S 121(d)(4); and the Pennsylvania Air Pollution Control Act, 25 PA Code SS 123.1, 123.2, 123.41, 127.1, 127.12, and 127.14. There are no chemical-specific ARARs for this alternative.

Alternative 5A - Excavation and On-site Treatment with Stabilization/Solidification:

Contaminated soil would be excavated, treated using a stabilization/solidification process, and placed back on-site in a containment cell. The excavated area would be backfilled with clean soil, graded to contour, and revegetated. Erosion control measures would be required during and after construction to manage and control storm water runoff.

Stabilization/solidification is a demonstrated treatment process that involves the mixing of contaminated soil with specific ratios of water, binder material, and other additives to enhance the physical and chemical properties. Contaminants are bound into a solid matrix as a result, immobilizing contaminants. A treatability study was conducted during the FS. However, even though PCB migration potential is minimized, the PCBs are still present in the waste and are not destroyed, requiring management controls to evaluate the long-term reliability of the process. Management controls will comply with the TSCA chemical waste landfill requirements under TSCA 40 C.F.R. S 761.75(b) with the exception of those management controls which are waived under CERCLA S 121(d)(4). These include: the requirement for construction of a chemical waste landfill in certain low permeable clay conditions [40 C.F.R. 761.75(b)(1)], the requirement to use a synthetic membrane liner [761.75(b)(2)], the requirement for a ground water leachate collection system [761.75(b)(7)], and the requirement that the bottom of the landfill be 50 feet above the historic high water table [761.75(b)(3)]. No air emissions or wastewater discharge is expected from the process but air emissions could occur during handling of excavated soil. Erosion control measures would be required during and after construction to manage and control storm water and sediment runoff. See the discussion of ARARs in Alternatives 5A, 5B and 5C, above, for those Federal and State laws that are applicable or relevant and appropriate to the remedy. The present worth cost would be $19,507,375.

Alternative 5B - Excavation and On-site Treatment with KPEG Dechlorination:

Contaminated soil would be excavated and treated on-site with a reagent mixture in a tank. Chemical reagents prepared from polyethylene glycols and potassium hydroxide have been demonstrated to dechlorinate PCBs. The resulting treated slurry would be separated and the treated soil would be returned to the Site. The used chemical reagent would be recycled or disposed off-site by incineration in a RCRA facility if determined to be a RCRA waste in accordance with RCRA Subtitle C, Hazardous Waste Management Requirements, 40 C.F.R. Parts 262, 263 and 264. KPEG is a closed process and no air emissions or waste gases would be expected. Erosion control measures would be required during and after construction to manage and control storm water runoff.

A treatability study conducted during the FS indicated that this process will achieve a residual PCB concentration of 2 ppm in the treated soil. However, during the treatability study it was observed that large amounts of suspended particles were present in the decanted reagent and that separation and removal of these suspended particles would likely require special material separation equipment and probably result in problems in process operation which may render the process ineffective. See the discussion of ARARs in Alternatives 5B and 5C, above, for those Federal and State laws that are applicable or relevant and appropriate to the remedy. The present worth cost of this treatment option is $24,424,400.

Alternative 5C - Excavation and On-site Treatment with Incineration:

Incineration is a well demonstrated technology for treatment of PCBs. A mobile incinerator would be brought to the Site and the contaminated soil would be excavated and incinerated on-site to meet TSCA incineration requirements set forth at 40 C.F.R. S 761.70. A trial burn would be required before implementing this alternative. Incineration technology has demonstrated greater than 99% destruction efficiency for PCBs. Waste incinerator gas would require treatment prior to discharge. Water from the incineration process would be treated off-site in a RCRA facility if required. Treatability studies conducted during the FS indicate that the treated residual soil would be a RCRA characteristic was based on TCLP analysis and would therefore, be disposed of in accordance with the RCRA Subtitle C, Hazardous Waste Management Requirements, 40 C.F.R. Parts 262, 263 and 264. Residual metals and ash would be solidified to meet RCRA land disposal treatment standards and placed on-site in a secure containment area. Erosion control measures would be required during and after construction to manage and control storm water. See the discussion of ARARs in Alternatives 5A, 5B and 5C, above, for those Federal and State laws that are applicable or relevant and appropriate to the remedy. The present worth cost would be $29,165,600.

Alternatives 6A, 6B, and 6C--Excavation, On-site Treatment of Contaminated Soils, and Containment

Capital Cost:	$11,236,950 to $17,648,230
Annual O&M Costs:	$ 103,600 to $ 138,250
Present Worth Costs:	$12,540,090 to $18,624,740
Implementation Time frame:	12 months

Alternative 6 is a hybrid combination of Alternatives 2, 3, and 4. This alternative requires excavation and treatment of approximately 8,000 cubic yards of contaminated soil with PCB concentrations exceeding 500 ppm and containment of approximately 12.5 acres (20,000 cubic yards) of contaminated soil having PCB concentrations between 25 ppm and 500 ppm using a 12-inch or greater soil cover. The soil cover would be the same as described in Alternative 3, including runoff controls and adequate containment in the vicinity of residential properties. Soils with PCB concentrations greater than 500 ppm would be excavated and treated using one of the three treatment alternatives evaluated in Alternative 4. Institutional controls would prohibit Site use for residential use as described in Alternative 2. Because these alternatives will result in contaminants remaining onsite, CERCLA S 121(c) requires that a site review be conducted every 5 years to monitor the effectiveness of this alternative. See the discussion of ARARs in Alternatives 2, 3 and 4 for those Federal and State laws that are applicable or relevant and appropriate to the remedy.

Alternative 6A - Excavation, Treatment using Stabilization/Solidification, and Containment:

This alternative would be a combination of Alternatives 2, 3, and 4A. Treatment using stabilization/solidification would be implemented as described in Alternative 4A. See the discussion of ARARs in Alternatives 2, 3 and 4 for those Federal and State laws that are applicable or relevant and appropriate to the remedy. The present worth cost is $12,540,090.

Alternative 6B - Excavation, Treatment using KPEG Dechlorination, and Containment:

This alternative would be a combination of Alternatives 2, 3, and 4B. Treatment using KPEG Dechlorination would be implemented as described in Alternative 4B. See the discussion of ARARs Sections 2, 3 and 4 for those Federal and State laws that are applicable or relevant and appropriate to the remedy. The present worth cost is $15,398,280.

Alternative 6C - Excavation, Treatment using Incineration, and Containment:

This alternative would be a combination of Alternatives 2, 3, and 4C. Treatment using incineration would be implemented as described in alternative 4C. See the discussion of ARARs in Alternatives 2, 3 and 4 for those Federal and State laws that are applicable or relevant and appropriate to the remedy. The present worth cost is $18,624,740.

Alternative 7 - Excavation and Off-site Disposal

Capital Cost:	$26,808,830
Annual O&M Costs:	$ 0
Present Worth Costs:	$26,808,830
Implementation Time frame:	24 months

This alternative involves excavation of approximately 28,000 cubic yards of contaminated soil with PCB concentrations exceeding 25 ppm and transportation to an off-site TSCA permitted landfill for disposal. Contaminated soil would be transported off-site either using rail cars or trucks depending on the location of the TSCA landfill. The estimated present worth cost includes excavation, transportation, and landfill costs. Prior to excavation, railroad tracks and ties would be removed as previously described. Any waste material or product generated during remediation activities which is determined to be a RCRA characteristic waste will be disposed in accordance with RCRA Subtitle C, Hazardous Waste Management Requirements, 40 C.F.R. Parts 262, 263 and 264. The excavated material would be backfilled with clean soil, revegetated, and graded to contour. Erosion control measures would be required during and after construction to manage and control storm water runoff. Institutional controls would prohibit Site use for residential use as described in Alternative 2. Because this alternative will result in contaminants remaining onsite, CERCLA S 121(c) requires that a Site review be conducted every 5 years to monitor the effectiveness of this alternative.

Location-specific ARARs include the Pennsylvania Erosion Control Regulations, 25 PA Code SS 102.1-102.5, 102.11-102.13 and 102.22-102.24; Action-specific ARARs include: TSCA, 40 C.F.R. S 761.20(c) relating to distribution of PCBs in commerce; and the Pennsylvania Air Pollution Control Act, 25 PA Code SS 123.1, 123.2, 123.41, 127.1; 127.1 and 127.14. There are no chemical-specific ARARs for this alternative.

ALTERNATIVES FOR RESIDENTIAL AND OTHER SOIL

Alternative 1--No Action

Capital Cost:	-0-
Annual O&M Costs:	-0-
Present Worth Costs:	-0-
Implementation Time frame:	-0-

The No Action alternative would involve no further excavation of soils from residential areas and properties. There are no action-specific, chemical-specific, or location-specific ARARs for this alternative.

Alternative 2--Excavation and Treatment of Residential Soils

Capital Cost:	$1,196,000 to $1,606,755
Annual O&M Costs:	$ 0
Present Worth Costs:	$1,196,000 to $1,606,755
Implementation Time frame:	6 months

Under this alternative, limited excavation of residential properties and drainage areas is proposed based on sampling conducted during the RI/FS. The goal of this remediation is to achieve an average PCB concentration of 2 ppm for individual residential properties. An average PCB concentration of 2 ppm is equivalent to approximately a 10[-5] excess cancer risk for residential exposure assuming no soil cover and is a protective, quantifiable concentration for soil. This risk assessment level satisfies EPA's "Guidance on Remedial Actions for Superfund Sites with PCB Contamination," US EPA, OSWER Directive: 9355.4-01, Office of Emergency and Remedial Response Hazardous Site Control Division (OS-220), August 1990 which is a TBC for the Site;

Soil would be excavated to a depth of approximately one foot, replaced with clean soil, and revegetated to original conditions. The excavated soil would be returned to the rail yard property and treated onsite. The exact location of excavation would be determined after discussion with property owners. Most of the property locations are along Central Avenue. The present worth cost of treatment is based on excavation and treatment of approximately 1000 cubic yards of soils but will vary depending on the exact locations of excavation and the volume of soils excavated.

Location-specific ARARs include the Pennsylvania Erosion Control Regulations, 25 PA Code SS 102.1-102.5, 102.11-102.13, and 102.22-102.24. Action-specific ARARs include the Pennsylvania Air Pollution Control Act, 25 PA Code SS 123.1, 123.2, 123.41, 127.1, 127.12 and 127.14; and TSCA - Manufacturing, Processing, Distribution in Commerce, and Use of PCBs and PCB Items, 40 C.F.R. S 761.20(c); TSCA Disposal Requirements, 40 C.F.R. S 761.60(a). There are no chemical-specific ARARs for this alternative. The present worth cost of this alternative is $1,196,000 to $1,606,755.

GROUND WATER TREATMENT AND FUEL OIL RECOVERY

Alternative 1--Fuel Oil Recovery and Ground Water Treatment

Capital Cost:	$ 0
Annual O&M Costs:	$ 120,000
Present Worth Costs:	$1,131,120

This remedial alternative is currently being implemented. This alternative involves on-site pumping of ground water contaminated with fuel oil in the vicinity of the maintenance building using three extraction wells, fuel oil recovery, ground water treatment using activated carbon, and discharge of the treated ground water on-site into the ground through an infiltration gallery. The recovered fuel oil is collected and disposed off-site in an approved RCRA disposal facility. Spent carbon would also be disposed off-site in an approved facility as required under TSCA and RCRA.

Ground water is contaminated with elevated levels of benzene, toluene, ethylbenzene, and xylene (BTEX) from the fuel oil. The MCL for benzene is 5 ug/l. Concentrations of benzene exceed the MCL under the Safe Drinking Water Act, 42 U.S.C. SS 300(f)-300(j) and 40 C.F.R. S 141.61. Ground water remediation will comply with the Pennsylvania ARAR for ground water for hazardous substances under PA Code SS 264.90-264.100 which requires that all ground water must be remediated to background quality. To the extent the EPA determines that background levels are less stringent than MCLs or that it is not technically practicable to remediate to background, then the remediation level will comply with the MCL for benzene promulgated under the Federal Safe Drinking Water Act, 42 U.S.C. SS 300f-300j, and 40 C.F.R. S 141.61.

Periodic on-site and off-site ground water monitoring would be provided over the life of this project to determine the effectiveness of the remedial effort. Because this action is currently ongoing, a No Action alternative will not be evaluated.

Chemical-specific ARARs include the Pennsylvania Hazardous Waste Management Regulations, 25 PA Code SS 264.90-264.100, specifically SS 264.97(i), (j) and 264.100(a)(9); the Safe Drinking Water Act 42 U.S.C. SS 300f 300j; and 40 C.F.R. Part 141, S 141.61; and the Pennsylvania Safe Drinking Water Act, 35 P.S. SS 721.1-721.17, and 25 PA Code Chapter 109, specifically SS 109.1109.4, 109.201, and 109.202. Action-specific ARARs include RCRA Subtitle C, Hazardous Waste Management Requirements, 40 C.F.R. Parts 262, 263 and 264 which govern all waste material or product generated during remediation activities, other than PCBs, which is determined to be a RCRA characteristic waste; and the SDWA, 42 U.S.C. S 300(d); and 40 C.F.R. Part 144. Location-specific ARARs for this alternative include the Clean Streams Law 35 P.S. SS 691.1 to 691.1001, and the National Pollution Discharge Elimination System regulations, 25 PA Code 92, and the Water Quality Standards, 25 PA Code 93.

RAIL YARD BUILDINGS AND STRUCTURES

Alternative 1--No Action

Capital Cost:	$ 0
Annual O&M Costs:	$247,200
Present Worth Costs:	$471,905
Implementation Time frame:	None

No action would be taken to decontaminate or otherwise address areas inside the car shop buildings contaminated with PCBs. The 1987 worker protection stipulation program would continue to be implemented. There are no chemical, location or action-specific ARARs for this alternative.

Alternative 2--Containment or Encapsulation

Capital Cost:	$280,000
Annual O&M Costs:	$ 10,000
Present Worth Costs:	$846,165
Implementation Time frame:	12 months

Epoxy resin would be applied to approximately 35,000 square feet of surface area in the car shop buildings with PCB concentrations in excess of 10 ug/100 cm[2]. Approximately 30,000 square feet of this area involves the concrete pits. This alternative would not generate any contaminated wastewater or solid waste for disposal. Proper personnel protective equipment and ventilation would be required during application of the epoxy resin. The worker protection stipulation program described under Alternative 1 would continue to be implemented. Action-specific ARARs include the TSCA Disposal Requirements, 40

C.F.R. S 761.60(a)(2)(iii). There are no chemical or location-specific ARARs for this Site.

Alternative 3--Decontamination

Capital Cost:	$260,000
Annual O&M Costs:	$ 0
Present Worth Costs:	$731,905
Implementation Time frame:	12 months

This alternative would involve decontamination of approximately 35,000 square feet of high contact surfaces in the car shop buildings having PCB concentrations in excess of 10 ug/100 cm[2]. High contact surfaces are defined as all wall surfaces up to eight feet in height above the main floor of the building and all surfaces within the repair pits. Depending on the type of surface, decontamination would be accomplished by wiping with a solvent, applying a chemical foam, shot blasting, or similar methods. Both the liquid application methods and more destructive blasting technology would generate waste material for disposal, and the more destructive surface removal techniques would generate large quantities of dust and debris for disposal. Any blasting activity must comport with the Pennsylvania Air Pollution Control Act, 25 PA Code Chapts. 123, 127; and with the TSCA Disposal Requirements, 40 C.F.R. 761.60. which are action-specific ARARs for this alternative. There are no location or chemical-specific ARARs for this alternative.

Proper personnel protective equipment would be required during decontamination. The worker protection stipulation program described under Alternative 1 would continue to be implemented.

Alternative 4--Decontamination and Demolition

Capital Cost:	$1,000,000
Annual O&M Costs:	$ 0
Present Worth Costs:	$1,471,905
Implementation Time frame:	18 months

The building would be decontaminated as described in alternative 3 and demolished. The building materials would either be disposed at an acceptable permitted facility or recycled. All materials with PCBs in excess of 50 ppm would be separated from the rest of the materials and either treated on-site in or disposed off-site in a TSCA landfill. Any blasting or demolition activity must comport with the Pennsylvania Air Pollution Control Act, 25 PA Code Chapts. SS 123.1, 123.2, 123.41, 127.1, 127.12 and 127.14 which are action-specific ARARs for this remedy.

Building demolition could not begin until after closure of the rail yard. The present worth cost is estimated at $1,000,000 based on disposal of debris material as a non-PCB waste. If the building were not decontaminated or the debris waste were otherwise determined to be PCB waste, the present worth cost of this alternative would be $8,834,750.

STREAM SEDIMENTS

Alternative 1--No Action

Capital Cost:	$ 0
Annual O&M Costs:	$ 4,200
Present Worth Costs:	$39,600
Implementation Time frame:	None

Under this alternative, no action would be taken to remediate contaminated sediments located in the streams and tributaries within the study area. A long-term environmental monitoring program would be implemented to assess the effectiveness of this alternative. This alternative would not comply with the Clean Streams Law, 35 P.S. SS 691.1 to 691.1001, the Water Quality Standards, 25 PA Code Chapt. 92, and the National Pollution Discharge Regulations, 25 PA Code Chapt 93. There are no location or action-specific ARARs for this alternative.

Alternative 2--Containment

Capital Cost:	$800,300
Annual O&M Costs:	$ 5,430
Present Worth Costs:	$851,500
Implementation Time frame:	2 months

Under this alternative, approximately 670 feet of stream sediments containing PCB concentrations greater than 10 ppm would be covered with a geotextile liner and rip rap to prevent erosion and direct contact. Streams would be diverted temporarily during implementation of this alternative. Temporary access roads would also be required which would have an ecological impact on the area. A long-term environmental monitoring program would be implemented to assess the effectiveness of this alternative. The Pennsylvania Dam Safety and Encroachments Act of 1978, P.L. 1375, as amended, 32 P.S. SS 693.1 et seq. and the Pennsylvania Dam Safety and Waterway Management Regulations, 25 PA Code SS 105.1 et seq. apply to stream relocation and/or encroachments and to wetland protection and are location-specific ARARS for this alternative. Other location-specific ARARs include 25 PA Code S 269(b)(1) and (2) which describe requirements for building a facility within a protected river corridor.

Alternative 3--Excavation and Treatment of Sediments with PCB Concentrations Exceeding 10 ppm and 1 ppm (Phased Approach)

Capital Cost:	$860,810 to $881,060
Annual O&M Costs:	$ 4,200
Present Worth Costs:	$900,400 to $920,650
Implementation Time frame:	2 months

This alternative requires that contaminated sediments along Valley Creek and Little Valley Creek and its tributaries be excavated and returned to the rail yard. In addition, the sediment inside the fence on Hollow Road would be excavated and treated along with rail yard soils. A phased approach would be implemented under this alternative. The first phase would involve excavation of 670 feet of stream sediments (63 cubic yards) with PCB concentrations exceeding 10 ppm. Following excavation, an environmental monitoring program would be implemented to assess the impact of remediation on the levels of PCBs in sediment, including Little Valley Creek and Valley Creek. If PCB levels do not decrease sufficiently to adequately protect human health and the environment, then additional excavation of approximately 6,800 feet of stream sediments (720 cubic yards) with PCB concentrations exceeding 1 ppm will be implemented. EPA is proposing this alternative as a phased approach to first evaluate the benefits of the initial stream excavation before proceeding with more extensive remediation.

The Pennsylvania Clean Streams Law, 35 P.S. SS 691.1 to 691.1001; the Water Quality Standards, 25 PA Code Chapt. 93, and the National Pollution Discharge Elimination System regulations, 25 PA Code Chapter 92; the Pennsylvania Dam Safety and Encroachments Act of 1978, P.L. 1375, as amended, 32 P.S. SS 693.1 et seq.; and the Pennsylvania Dam Safety and Waterway Management Regulation, 25 PA Code SS 105.1 et seq.; apply to stream relocation and/or encroachments, to wetland protection, and to discharges to surface water, and are location-specific ARARs for this alternative. The Endangered Species Act of 1973, 16 U.S.C. S 1651 et seq., may be applicable if a determination is made that endangered species are present or will be affected by the remedial alternative. There are no chemical-specific or action-specific ARARs for this alternative.

Alternative 4--Excavation and Treatment of Sediments with PCB Concentrations Exceeding 1 ppm

Capital Cost:	$5,701,720 to $5,909,220
Annual O&M Costs:	$ 0
Present Worth Costs:	$5,701,720 to $5,909,220
Implementation Time frame:	10 months

This alternative requires that approximately 7500 feet (785 cubic yards) of stream sediments along Valley Creek and Little Valley Creek and its tributaries with PCB concentrations exceeding 1 ppm be excavated and returned to the rail yard for treatment. Sediment inside the fence on Hollow Road would be excavated and treated along with rail yard soils. Initially, stream areas exceeding 10 ppm would be excavated and natural deposition areas would be excavated on a regular basis over a period of five years. Stream sediment monitoring will be conducted periodically to evaluate the effectiveness of the excavation program in achieving the 1 ppm cleanup standard. After a period of five years, the need for additional stream excavation in order to meet the 1 ppm cleanup standard will be evaluated. Implementation of this alternative may require installation of up to 12,000 feet of access roads based on estimates in the FS report. During implementation of the remedy, destruction and loss of natural habitat along the stream corridor(s) would need to be considered and minimized where possible, using less destructive excavation methods such as vacuum dredging of sediments. A restoration program will also be required following remediation. See the discussion of ARARs in Alternative 3 above for a list of those Federal and State regulations that are ARARs for this alternative.

IX. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial action alternatives described above were evaluated using nine evaluation criteria. The resulting strengths and weaknesses of the alternatives were then weighed to identify the alternative providing the best balance among the nine criteria. These criteria are:

Threshold Criteria

- Overall protection of human health and the environment;
- Compliance with applicable or relevant and appropriate requirements;

Primary Balancing Criteria

- Reduction of toxicity, mobility, or volume;
- Implementability;
- Short-term effectiveness;
- Long-term effectiveness;
- Cost;

Modifying Criteria

- Community acceptance;
- State acceptance;

A. Protection of Human Health and the Environment

A primary requirement of CERCLA is that the selected remedial action be protective of human health and the environment. A remedy is protective if it eliminates, reduces, or controls current and potential risks through each exposure pathway to acceptable levels through treatment, engineering controls, or institutional controls.

Based on the baseline risk assessment conducted by EPA, the greatest human health risk from exposure to PCBs is dermal contact and incidental ingestion of PCBs. In order to meet remedial objectives, the risk associated with exposure to PCB contaminated soil must fall within the acceptable risk range of 10[-4] to 10[-6] for carcinogens, with 10[-6] risk considered a point of departure.

EPA has determined that an environmental risk exists requiring remediation of PCB-contaminated stream sediments. This is based on the presence of elevated levels of PCBs in sediments and aquatic organisms, the known potential for food chain exposure and bioaccumulation of PCBs, and the weight of evidence indicating PCB toxicity at levels that exceed the baseline levels for the Paoli study area.

All of the technologies that utilize excavation and treatment of contaminated soils and sediments provide protection of human health and the environment by removing PCB-contaminated soils and sediments that exceed the risk-based cleanup standard and solidifying them. The selected alternatives for rail yard soil and residential soil reduce the incremental cancer risk to approximately 10[-5] after treatment.

<u>Rail Yard Soils</u>

Alternative 1 (No Action) and Alternative 2 (Institutional Controls) are not protective since they would allow soil to remain at concentrations exceeding risk-based cleanup standards.

Alternative 3 (Containment of Contaminated Soils) would provide less than adequate protection since no treatment would be used to immobilize the contaminants from migrating off-site.

Alternative 4 (Excavation and treatment of soils with PCB concentrations greater than 500 ppm) is not protective since a major portion of the contaminated soil which exceeds a 10[-4] risk range is not treated or contained.

Alternative 5 (Excavation and treatment of soils with PCB concentrations greater than 25 ppm) provide adequate protection of human health because it reduces the incremental cancer risk to approximately

10[-5] after treatment. EPA believes it is not technically practicable to reduce risks to the 10[-6] or lower risk range based on the quantity of soil to be treated, the practical limits of detection of PCB in soil, and institutional controls requiring that the future use of the rail yard be limited to non-residential use. Alternatives 3 and 6 would provide less than adequate protection of human health and the environment since containment rather than treatment is used.

Alternative 6 (Excavation and treatment using stabilization/solidification of soil with PCB concentration exceeding 500 ppm and containment of soil with PCB concentrations between 25 and 500 ppm) would provide limited protection to on-site workers and would allow for the future migration of PCB contamination into neighboring residential areas and into ecologically sensitive streams.

Alternative 7 (Excavation and off-site disposal of soils and sediments) would be protective at the Paoli Rail Yard Site but would result in transferring risks from one location to a subsequent location where the wastes are disposed.

<u>Residential and other Soils</u>

Alternative 1 (No Action) would not be protective since it would allow soil to remain in residential areas at concentrations up to 50 ppm equivalent to a risk that exceeds the 10[-4] risk range.

Alternative 2 (Excavation and treatment of residential soils) would provide an adequate level of PCB protection (2 ppm average per property) to residents, especially children.

<u>Ground Water Treatment and Fuel Oil Recovery</u>

The alternative for fuel oil recovery and ground water treatment is protective and meets the acceptable risk range for benzene (a carcinogen) by attaining the Federal MCL concentration. This alternative provides the best level of long-term protection of human health and the environment.

<u>Rail Yard Buildings and Structures</u>

Alternative 1 (No Action) would require that the 1987 worker protection program stipulation continue to be implemented and would adequately protect workers potentially exposed in the car shop and rail yard. This alternative would not be protective to any future workers, or to any future yard or building inhabitants or workers.

Alternative 2 (Containment or Encapsulation) would result in a short-term remedy adequate to protect health of workers and nearby residents but provide no assurance that future use scenarios could maintain this level of protection. In addition, future demolition of the buildings could result in exposures to workers and to local residents, and would result in higher disposal costs.

Alternative 3 (Decontamination) for rail yard buildings and structures requires workers to wear personnel protection gear and follow hygiene protocols during use of the building by SEPTA employees. Decontamination of the building after the rail yard maintenance activities cease will minimize any future risk by eliminating the most highly contaminated surfaces in the interior of the car shop building.

Alternative 4 (Decontamination and Demolition) would require that all rail maintenance buildings be decontaminated prior to demolition and disposal, and would likely require that demolition debris be disposed off-site, resulting in increased risk during demolition and off-site transport.

<u>Stream Sediments</u>

Alternative 1 (No Action) would not protect humans or plant and animal life forms indigenous to the streams and the associated environment.

Alternative 2 (Containment) would contain the migration of contaminants further downstream in the various connecting streams. This alternative would not reduce the volume of contaminants already in the stream and associated runoff areas. Since it is known that significant concentrations of PCBs exist in the stream and biomass, this alternative would not provide adequate protection to sensitive species nor would it reduce the existing accumulation of PCBs.

Alternative 3 (Phased Approach) would be less protective than alternative 4 since stream sediment concentrations less than 10 ppm would not be excavated unless additional environmental monitoring demonstrated that further stream excavation is warranted, and would not provide for periodic continued excavation over a five year period with stream monitoring as described under Alternative 4. Although this approach would initially minimize any impacts to the stream by excavation, Alternative 3 would not ensure that the cleanup standard of 1 ppm would be achieved in a reasonable period of time.

Alternative 4 (Excavation and Treatment of Sediments with PCB concentrations Exceeding 1 ppm) would provide a greater level of protection than Alternative 3 and could be achieved with minimal environmental damage as described in the ROD. EPA believes that a cleanup standard of 1 ppm will provide adequate protection of the environment and that lower cleanup standards could not be achieved without significant deleterious effects to the local environment.

B. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Compliance with ARARs addresses whether a remedy will meet all Federal and State environmental laws and/or provide the basis for a waiver from any of these laws. The selected remedy will meet all ARARs as described under Statutory Determinations except for the TSCA chemical waste landfill requirements, 40 C.F.R. S 761.75, which are waived pursuant to the waiver authority contained under CERCLA S 121(d)(4) as discussed under Statutory Determinations. TSCA requirements are potential ARARs for each remedy involving remediation and landfilling of PCB contaminated wastes.

PCBs are addressed under RCRA in 40 CFR Part 268 which describes the prohibitions on land disposal of various hazardous wastes. PCBs alone are not a RCRA hazardous waste. RCRA-listed waste was not disposed at the rail yard and the contaminated PCB soil is not a RCRA-characteristic waste. RCRA prohibitions on land disposal of hazardous waste and RCRA closure requirements are not considered ARARs for this Site. Any waste material or product generated during remediation activities which is determined to be a RCRA characteristic waste will be disposed in accordance with RCRA Subtitle C, Hazardous Waste Management Requirements.

Ground water remediation will comply with the Pennsylvania ARAR for ground water for hazardous substances under PA Code SS 264.90-264.100 which requires that all ground water must be remediated to background quality. To the extent the EPA determines that background levels are less stringent than MCLs or that it is not technically practicable to remediate to background, then the remediation level will comply with the MCL for benzene (5ug/l) promulgated under the Federal Safe Drinking Water Act ("SDWA"), 42 U.S.C. SS 300f-300j, and 40 C.F.R. 141.61.

C. Reduction of Toxicity, Mobility, or Volume Through Treatment

Rail Yard Soils

This evaluation criteria addresses the degree to which a technology or remedial alternative reduces toxicity, mobility, or volume of hazardous substances. The Superfund program, as required by the NCP, uses as a guideline for effective treatment the range of 90 to 99 percent reduction in the concentration or mobility of contaminants of concern.

Alternative 1 (No Action), Alternative 2 (institutional controls), and Alternative 7 (excavation and off-site disposal) do not provide for treatment to reduce toxicity, mobility, or volume of contaminated soil through treatment.

Alternative 3 (containment) provides no reduction of toxicity or volume through treatment but does reduce the mobility of the waste through containment.

Alternatives 4 and 5 employ treatment using either the solidification/stabilization process, the KPEG process, or incineration. Alternative 5A, the preferred alternative for excavation and treatment of soils and sediments, will limit the mobility of PCBs since the physical and chemical characteristics of the waste will be altered through treatment, but will not reduce toxicity or volume. The mobility of the waste will be limited by immobilization using the stabilization/solidification process, but will not achieve a toxicity reduction of 90 to 99 percent based on the PCB concentration in the untreated soil and the solidified soil. None of the treatment alternatives evaluated will reduce the volume of waste. Treatment alternatives using incineration or the KPEG process will reduce toxicity by destroying PCBs to varying degrees. The soil treated by incineration would be expected to exhibit toxic leaching characteristics for certain metals, thereby increasing the toxicity and mobility.

Alternative 6 (treatment and containment) provides less treatment since only wastes above 500 ppm PCBs are treated.

Residential and other Soils

Alternative 1 (No Action) requires no further excavation and treatment of residential soils and provides no reduction of toxicity, mobility, or volume through treatment.

Alternative 2 will reduce the toxicity, mobility, and volume of contaminated soil in the residential area through excavation and treatment of the soil at the rail yard.

Ground Water Treatment and Fuel Oil Recovery

Ground water treatment would reduce the toxicity and mobility of contaminants in ground water by treating benzene in ground water and by recovering fuel oil.

Rail Yard Buildings and Structures

Alternative 1 (No Action) would not reduce the toxicity, mobility, or volume through treatment.

Alternative 2 (containment or encapsulation) would reduce the mobility of the waste on a short-term basis by applying an epoxy resin to the car shop surface, but would not reduce the toxicity or volume of contaminated building surfaces.

Both Alternative 3 (decontamination) and Alternative 4 (decontamination and demolition) would reduce the toxicity, mobility, and volume of contaminated surfaces within the car shop building using a destruction decontamination technology such as a liquid solvent, chemical foam, or shot blasting. Alternative 4 would result in the complete removal of decontaminated building material from the rail yard but would not significantly increase the amount of building material decontaminated when compared with Alternative 3.

Stream Sediments

Alternative 1 (No Action) would not reduce the toxicity, mobility, or volume through treatment.

Alternative 2 (containment) would reduce the mobility of contaminated sediments caused by stream erosion but would not reduce the toxicity or volume of contaminants through treatment.

Alternatives 3 and 4 employing treatment would reduce the toxicity, mobility, and volume by excavating contaminated stream sediments. Alternative 4 would ultimately result in greater reduction of contaminated sediments since a 1 ppm cleanup standard would be implemented versus a 10 ppm cleanup standard under Alternative 3.

D. Short-Term Effectiveness

Short-term effectiveness involves the period of time needed to achieve protection and any adverse impacts of human health and the environment that may be posed during the construction and implementation period until cleanup standards are achieved.

Rail Yard Soil

Alternative 1 (No Action) and Alternative 2 (institutional controls) could be implemented immediately and would not have any adverse impacts.

Alternative 3 (containment) would require that a large amount of clean soil be brought onto the rail yard and would likely result in increased truck traffic and generation of dust during construction of the containment cover. Dust suppression measures and air monitoring would be required. This work could be completed in a short time frame of approximately 6 months.

Alternatives 4, 5, and 6 would involve excavation and treatment of contaminated soil. Some particulate emissions may occur during implementation. Dust suppression control measures during excavation of rail yard soils and residential soils and air monitoring would be required. During construction there would be noise and truck traffic that may temporarily affect local residents. Alternatives 3 and 6 which involve containment would be anticipated to have fewer short-term adverse impacts than Alternatives 4 and 5 which require treatment of contaminated soils.

Alternative 7 would require excavation and off-site disposal involving transportation of contaminated material and would have more potential for short-term adverse impacts than Alternatives 2, 3, 4, 5, and 6 since a larger population would be exposed to contaminated material. Alternative 7 would require approximately two years to implement.

Because the Paoli rail yard is currently an active rail yard facility and is not expected to cease operation until June 1994, remediation of rail yard soils can not begin until the rail yard closes. Implementation of Alternative 5 will require approximately 2 years to complete. Alternatives 3, 4, and 6 will require 6 to 12 months to complete since less soil will be excavated and treated compared to alternative 5.

Residential and other Soil

Alternative 1 (No Action) could be implemented immediately with no adverse impact.

Alternative 2 requiring excavation of residential soil would be expected to inconvenience residents. During construction there would be noise and truck traffic that may temporarily affect local residents. Dust suppression control measures during excavation and air monitoring would be required. Residential soil excavation can be implemented within approximately six months after work begins and can be completed during the time that the rail yard is still operating.

Ground Water Treatment and Fuel Oil Recovery

The fuel oil recovery and ground water treatment program is now ongoing and is expected to be a long-term remedial action.

Rail Yard Buildings and Structures

Alternative 1 could be implemented immediately with no short-term health impacts.

Alternatives 2, 3, and 4 would generate dust during the process and construction workers could be exposed to PCBs through direct contact with dust through inhalation or incidental ingestion. Suitable personnel protection equipment would be required along with dust suppressant controls. Alternatives 2, 3 and 4 would not be implemented until after remediation of rail yard soils was completed to prevent further contamination of the building. Alternatives 2 and 3 would each require approximately 12 months to complete; Alternative 4 would require 18 months with the additional time needed for building demolition.

Stream Sediments

Alternative 1 (No Action) could be implemented immediately with no adverse impact.

Alternative 2 (containment) would require that streams be temporarily diverted and access roads be constructed during implementation of the alternative. This would have an ecological impact on the area and result in suspension of stream sediments. This alternative would require two months to implement.

Alternatives 3 and 4 would result in disturbance of the stream areas excavated and surrounding resource areas due to suspension of sediment and construction of access roads. Such impacts may include the destruction of natural vegetation and trees, and the loss of plant and aquatic organisms. During implementation, steps will be taken to minimize habitat damage and reduce the amount of road construction required by using less destructive methods of stream excavation such as vacuum dredging to the maximum extent practicable. Any wetland areas impacted will be restored. Alternative 4 selected in the ROD would be implemented over a 5 year period while remediation of residential soils, rail yard soils, and buildings and structures is completed.

E. Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup standards have been met.

Rail Yard Soils

Alternatives 1 and 2 which do not provide treatment, do not provide reliable protection of human health and the environment over time.

Alternatives 4, 5, 6, and 7 involving excavation and treatment of rail yard soils will be effective and permanent solutions to the risks currently posed by PCB-contaminated soil. Treatment using stabilization/solidification in combination with long-term management controls and placement of the solidified material in a containment cell will permanently reduce risk through direct contact and exposure and prevent PCB transport through leaching, erosion, and runoff. The preferred alternative which immobilizes PCBs through solidification will provide less long term permanence than alternatives such as incineration, but provides a much greater degree of long-term effectiveness and permanence than Alternative 3, containment.

Residential and other Soils

Alternative 1 does not provide reliable protection of human health and the environment over time.

Alternative 2 (excavation of PCB contaminated soil 2 ppm or greater) will provide a highly effective and permanent solution to the risk in the residential neighborhood currently posed by PCB-contaminated soil.

Ground Water Treatment and Fuel Oil Recovery

The preferred alternative for ground water remediation will prevent any migration of fuel oil and PCBs from the vicinity of the rail yard and will require long-term ground water monitoring.

Rail Yard Buildings and Structures

Alternatives 1 (No Action) and 2 (containment) provide less long-term protection than Alternatives 3 and 4. Decontamination of building surfaces is a highly effective method of treatment for PCB removal. Alternative 4 would effectively remove all building surfaces following decontamination.

Stream Sediments

Alternative 1 would provide no long-term protection and Alternative 2 (containment) would be less effective than stream excavation due to the possibility of long-term erosion of the contained area and increased maintenance.

Alternatives 3 and 4 requiring stream excavation would be highly effective over the long-term in eliminating the environmental impact from PCB contamination.

F. Implementability

Implementability is the technical and administrative feasibility of a remedy, including the availability of goods and services needed to implement the chosen solution.

Rail Yard Soil

After the rail yard ceases operation and railroad tracks are removed, soil excavation and treatment will be relatively easy to implement. Stabilization/solidification is a demonstrated technology and treatability studies using soil from the Site have been conducted to evaluate the effectiveness of the technology. Additional treatability studies will be required prior to final design. Use of a mobile incinerator is less common than use of a fixed place incinerator. A trial burn would be required to demonstrate this technology and the treated soil would be expected to exhibit toxic leaching characteristics, requiring possible additional treatment to render the treated soil non-toxic and reduce mobility of the soil. The KPEG process has been demonstrated on a laboratory scale but has limited field testing. Treatability tests during the FS on soils from the Paoli rail yard indicated that the high cinder and ash content would cause potential operational and maintenance problems with solids handling. Off-site disposal of contaminated soils would be dependent on the availability of a TSCA-permitted landfill which are not located along the east coast. Transportation would be by rail car if possible to minimize truck traffic and use of open roads.

Residential and other Soil

Alternative 1 would require no excavation. Alternative 2 could be implemented using excavation procedures similar to the previous soil removal program conducted in 1988-1989 using excavation equipment and hand excavation for soil removal. Erosion control measures would be used, access would be restricted to excavation areas, and excavated areas would be backfilled with clean soil and revegetated in consultation with individual property owners. Site access to private properties will be required.

Rail Yard Buildings and Structures

Decontamination methods proposed under Alternatives 3 and 4 for the car shop surfaces have been demonstrated in the TSCA program.

Demolition of the car shop buildings and structures under Alternative 4 would not be necessary for remediation of the rail yard soils and the building can be satisfactorily decontaminated without demolition. Demolition would result in increasing health impacts on construction workers and the surrounding community and may increase the cost of the remedy by an additional $7 million if the demolished building material must be disposed off-site at a TSCA landfill.

Ground Water Treatment and Fuel Oil Recovery

The ability to implement the fuel oil recovery system has already been demonstrated.

Stream Sediments

Alternatives 2, 3, and 4 could be implemented but would require a certain amount of construction of access roads which may be difficult in some areas because of the steep terrain. Alternative 4 proposes to minimize the construction of access roads and the amount of truck traffic required by use of vacuum dredging and additional stream monitoring and sediment transport studies to measure the effectiveness of the remediation.

G. Cost

The present worth cost of each alternative, along with the capital cost and annual operation and maintenance cost, is described under each alternative under Section VIII, Description of Alternatives.

The estimated cost of all the selected alternatives is approximately $28,268,000. This figure represents the "present worth value" of all future cost activities associated with the selected alternative. This estimate is used for cost comparison purposes. Treatment of additional quantities of soils and sediments other than what has been estimated in the ROD and FS will also change the cost of remediation proportionately. Other treatment alternatives using either the KPEG process or incineration have higher fixed costs, while containment options have lower fixed costs.

H. State Acceptance

The Commonwealth of Pennsylvania concurs with the selected remedy.

I. Community Acceptance

Community acceptance is assessed in the attached Responsiveness Summary. Several members of the local community requested that the car shop building be demolished. Other commentors requested that more stringent cleanup standards be set. EPA received a number of comments requesting that the environmental impact of the stream remediation be further considered when selecting the cleanup alternative for stream sediments. The PRPs did not concur with the remedy selection.

X. SELECTED REMEDY: DESCRIPTION AND PERFORMANCE STANDARD(S) FOR EACH COMPONENT OF THE REMEDY

EPA has selected the following remedies for the Paoli Rail Yard Site:

Rail Yard Soils: The selected alternative is Alternative 5A. This alternative requires excavation and on-site treatment of contaminated soils using stabilization/solidification for soils with PCB concentrations exceeding 25 ppm, and deed restrictions. After treatment, the solidified material would be placed back on-site in a containment cell.

Ground water Treatment and Fuel Oil Recovery: The selected alternative is Alternative 1. This alternative requires continued implementation of the fuel oil recovery and ground water treatment program and ground water monitoring.

Rail Yard Buildings and Structures: The selected alternative is Alternative 3, decontamination of surfaces having PCB concentrations in excess of 10 ug/100 cm[2].

Residential and Other Soils: The selected alternative is Alternative 2, excavation of residential soils to achieve an average PCB concentration of 2 ppm per individual property.

Stream Sediments: The selected alternative is Alternative 4, excavation of stream sediments exceeding 1 ppm.

The performance standard(s) for each selected alternative will be described below.

Performance Standards

Rail Yard Soil

A. Performance Standards

The selected remedial action shall require excavation and on-site treatment of rail yard soils with PCB concentrations of 25 mg/kg or greater using a stabilization/solidification process. This would require excavation and treatment of approximately 28,000 cubic yards of contaminated soil located over approximately 15 acres of the rail yard property, primarily in the vicinity of the existing rail tracks. This remedial action shall include treatment of approximately 3000 cubic yards of soil from the previous residential soil removal program now located on the rail yard property in a lined containment cell.

In order to evaluate the effectiveness of the stabilization and solidification process, the following physical and chemical tests of treated solidified soil shall be established as Performance Standards. Performance standards shall be demonstrated in the laboratory and in field testing during construction.

- The Toxicity Characteristic Leaching Procedure (TCLP) test for PCBs shall be 4 ppb or less.

- The 28-day unconfined compressive strength shall be greater than 100 psi (ASTM Method D2166 or equivalent).

- The triaxial permeability shall be less than 1 x 10[-7] cm/sec (USACE Method 1110-2-1906 or equivalent). All contaminated soil which has been treated using the stabilization/solidification process shall be placed on rail yard property in a dedicated containment cell (or cells). The location of the cell (or cells) shall be determined during remedial design. The containment cell(s) shall be constructed to include a monitoring system capable of detecting leakage from the cell(s). Ground water monitoring for PCBs, metals, volatile organic compounds, and semi-volatile organic compounds shall be conducted on a quarterly basis for the first two years of operation and semi-annually thereafter with approval of EPA in consultation with Pennsylvania DER. Routine maintenance and inspection of the cell(s) shall be performed.

The containment cell(s) shall be designed with a final impermeable cap designed to: (1) provide a hydraulic barrier with a hydraulic conductivity of 10[-7] cm/sec or less; (2) provide long-term minimization of migration of liquid through the containment cell; (3) minimize erosion or abrasion of the cover, and (4) prevent freezing and thawing effects of the solidified material (This impermeable cap is not a RCRA cap and there are no RCRA ARARs that are applicable, relevant or appropriate).

Excavated areas of contaminated soil shall be backfilled with clean soil, graded to contour, and revegetated. Routine maintenance and inspection of the excavated area shall be performed.

Air monitoring shall be required during excavation of rail yard and residential soils and operation of the stabilization and solidification process to determine if there are emissions of PCBs adsorbed to particulates or if PCBs or other organics are otherwise volatilized. Dust suppression measures such as application of water or foam sprays shall be required, and additional mitigative measures in addition to dust suppression measures shall be taken if necessary to meet State and Federal air pollution requirements.

Because the remediation is scheduled to be conducted in conjunction with cessation of rail yard operation, all rail track and railroad ties in the vicinity of the excavated soil, along with the railroad tie pile in the vicinity of the turnaround track, shall be removed, decontaminated, and either reused, transferred to a scrap metal dealer, or otherwise disposed offsite. Other rail yard debris would be disposed in a similar manner. All off-site disposal shall be done in compliance with Federal and State ARARs.

Because the selected remedy will result in contaminants remaining on-site, 5-year site reviews under Section 121(c) of CERCLA will be required to monitor the effectiveness of the remedy.

B. Erosion and Sedimentation Controls

A storm water collection system consisting of three catch basins, diversion controls, and filter fabric has been constructed to manage and control storm water runoff and erosion from the rail yard. The performance standard for this system shall be that it: (1) effectively collect and control at least the water volume resulting from a 24-hour, 25-year storm and prevent or effectively minimize erosion from the rail yard property, both prior to, during, and after construction; and (2) be inspected and maintained on a regular basis (at least semi-annually).

In order to maintain the integrity and effectiveness of this system, an erosion and sedimentation control plan shall be submitted as part of the remedial design to evaluate the effectiveness of the existing system and make recommendations for any changes in the system based on construction activities and closure of the rail yard. This plan shall evaluate the effectiveness of the present Site erosion and sedimentation controls to include sampling of surface runoff to provide a base line from which future erosion and sedimentation control measures shall be determined.

C. Deed Restrictions

As soon as practicable, restrictions shall be placed in the deed to the rail yard to prohibit: (1) use of the property for residential or agricultural purposes; and (2) the use of on-site ground water for domestic purposes, including drinking water. The continuing need for these restrictions will be re-evaluated during the 5-year site reviews under Section 121(c) of CERCLA.

D. Additional Treatability Studies

During the FS, treatability studies were conducted on the solidified rail yard soil to evaluate the PCB leaching characteristics and structural integrity of the solidified material. Additional testing methods are available that provide a variety of additional information on mobility and leaching characteristics of PCBs depending on the specific test.

An expanded treatability study shall be conducted as soon as practicable to further assess the stability and physical characteristics of the stabilization/solidification process and to demonstrate the predicted effectiveness of the stabilization/solidification process. The recommended tests shall include, but not be limited to, (1) the American Nuclear Society Leach Test Method ANS-16.1 conducted for a 90-day period (2) TCLP analysis on the intact solidified material (3) additional leaching test(s) on solidified samples subjected to test procedures to simulate long term weathering such as freeze-thaw, compression, etc., and (4) evaluation of chemical/physical properties such as temperature and pH on the solidification process.

E. Fuel Oil Soils

An estimated 14,000 cubic yards of subsurface soils contaminated with PCBs and fuel oil at depths of 20 feet or more are located in the vicinity of the car shop building. PCB concentrations range from 1 ppm to 500 ppm, with approximately 100 cubic yards containing PCBs at concentrations greater than 500 ppm. This area is now covered with an impermeable asphalt cover and will be remediated by a ground water treatment and fuel oil recovery system as described in the ROD.

EPA is not requiring that the subsurface fuel oil soils be excavated and treated. The asphalt cover shall remain intact and the ground water treatment and fuel oil recovery system shall be effectively operated to achieve ground water cleanup standards required in the ROD. If the pump and treat system is determined to be ineffective in recovering fuel oil and remediating the contaminated ground water plume, then EPA might determine that the contaminated soil with PCB concentrations equal to or exceeding 25 ppm shall be excavated. If such a decision is made, EPA will amend the ROD or issue an Explanation of Significant Differences in accordance with the National Contingency Plan.

Rail Yard Buildings and Structures

Decontamination of approximately 35,000 square feet of rail yard car shop buildings and structures shall be required following completion of rail yard construction activities. The performance standard shall require decontamination of high contact surface areas that exceed a PCB concentration of 10 ug/100 cm[2] based on a standard wipe test sampling procedure. Depending on the type of surface material, decontamination shall be accomplished by wiping with a solvent, applying a chemical foam, shot blasting, or equivalent methods. Proper personnel protective equipment shall be required during decontamination. Any liquids, dust, or debris generated during decontamination shall be collected for disposal. Decontamination procedures shall be conducted in accordance with the Federal and State regulations.

SEPTA has implemented a worker protection program in accordance with a Stipulation filed July 13, 1987 between SEPTA and the United States of America. The performance standard for this ROD shall require that this Stipulation continue to be implemented.

Ground Water Treatment and Fuel Oil Recovery

Ground water in the vicinity of the car shop building is contaminated with fuel oil and elevated levels of benzene, toluene, ethylbenzene, and xylene (BTEX) from the fuel oil. The preferred remedial alternative is currently being implemented. This alternative shall require recovery of on-site ground water in the vicinity of the car shop contaminated with fuel oil, ground water treatment using filtration and activated carbon, and discharge of the treated ground water on-site through a subsurface infiltration gallery. The recovered fuel oil shall be disposed off-site at an EPA approved disposal facility.

A. Performance Standards for Ground Water

The ground water treatment system and fuel oil recovery system shall continue to be operated throughout the area of fuel oil contamination on a continuous basis to (1) remove fuel oil to the maximum extent practicable, and (2) achieve the MCL for benzene or the background concentration for benzene, whichever is more stringent. EPA shall determine the background concentration for benzene based on data obtained using procedures for ground water monitoring outlined in 25 PA Code S 264.97. In the event that benzene is not detected in samples taken for the establishment of a background concentration, the detection limit for the method of analysis utilized with respect to benzene shall constitute the "background" concentration of the contaminant.

The remediation goal to achieve a background concentration of benzene is based on achieving the Pennsylvania ARAR under 25 PA Code SS 264.90264.100 which requires aquifer remediation of contaminants of concern to background levels. The MCL for benzene established under the Federal Safe Drinking Water Act (the Federal ARAR) is 5 ug/l. The MCL for benzene is set forth at 40 C.F.R. S 141.61. The detection limit for benzene is 0.2 ug/l based on method 601/602 found at 40 C.F.R. Part 136.

If EPA determines that implementation of the selected remedy demonstrates that it will be technically impracticable to achieve and maintain the performance standards throughout the entire area of ground water contamination, chemical-specific ARARs may be waived for those portions of the aquifer for which EPA determines that it is technically impracticable to achieve further contaminant reduction.

Achieving the concentration ARAR for ground water shall mean that ARAR levels for benzene have been attained throughout the area of attainment and remain at the required levels for twelve consecutive quarters. If it becomes apparent to EPA during implementation or operation of the ground water extraction system that contaminant levels have ceased to decline and are remaining constant at levels higher than the Performance Standards over some portion of the contaminated area, then EPA will determine the need for additional response.

All extracted ground water shall be treated to levels which shall permit subsurface discharge on-site in compliance with Federal and State regulations as discussed in the groundwater alternatives. Recovered fuel oil and spent carbon from the ground water treatment system shall be disposed off-site in accordance with Federal and State regulations.

EPA has evaluated the potential for PCBs leaching into ground water at the PCB cleanup standard concentration in soil remaining after completion of the remediation. The leaching potential of PCBs at varying concentrations and using different cap designs has been evaluated in the EPA "Guidance or Remedial Actions for Superfund Sites with PCB Contamination," OSWER Directive No. 9355.4-01, August, 1990. A transport model for PCBs was used at Paoli since PCBs are the primary contaminant of concern. The transport model predicts that for a PCB concentration of 20 ppm in the soil, the maximum concentrations in the ground water will be 0.116 ug/l (ppb) for an impermeable cap with permeability of 10[-7] cm/sec (similar to Paoli design) occurring after 1645 years. This analysis indicates there is no potential threat to ground water especially in light of the high clay content of the native soils.

B. Long-Term Ground Water Monitoring

A long-term ground water monitoring program shall be implemented to evaluate the effectiveness of the ground water pumping and treatment system and fuel oil recovery system. Monitoring wells installed in the area of fuel oil contamination shall be sampled until such time as EPA determines that the Performance Standard has been achieved to the extent technically practicable throughout the entire area of contamination. Sampling shall be conducted on a quarterly basis and shall include, as a minimum, BTEX compounds, total petroleum hydrocarbons, and PCBs. The PCB concentration in recovered fuel oil shall be sampled on a semi-annual basis. If ground water monitoring indicates the presence of PCBs for two consecutive quarters, EPA will consider appropriate responses.

Sampling of residential wells was not included in the RI, as most residences in the study area are supplied by public water having a source outside of the study area. Private residences along Hollow Road have been identified that continue to use wells for water supply. As part of the long-term ground water monitoring program, sampling of each well shall be conducted on an annual basis and shall include, as a minimum, PCBs, volatile organic compounds, and semivolatile organic compounds. If any ground water monitoring event indicates the presence of contaminants that exceed a final or proposed MCL, then the well shall be resampled immediately, and EPA shall consider appropriate responses.

Residential Soils

Cleanup standards for residential soil shall be accomplished by excavating soil from individual private properties adjacent to the rail yard in order to achieve an average PCB concentration of 2 ppm per individual property. The depth of excavation shall be a minimum of 12 inches. Excavated soil will be returned to rail yard property and treated using the stabilization and solidification process. The entire area of excavation shall be backfilled with clean soil, graded, revegetated, and restored to its original condition.

During the conduct of the RI, composite and grab samples were collected from individual properties to determine the extent of contamination. Composite samples were primarily used to define areas of contamination in residential yards.

Where a composite property sample collected during the RI indicates a PCB concentration of greater than 2 ppm, either (1) the entire area sampled (i.e., entire front yard, flower garden, play area, etc.) shall be excavated or (2) or a representative number of discrete grab samples shall be collected to define areas of excavation.

Discrete surface soil sampling shall be required to verify if the cleanup standard of 2 ppm has been achieved. The cleanup standard of 2 ppm shall be achieved if, after excavation and backfilling, verification sampling using a representative number of discrete grab samples from both excavated and non-disturbed areas indicates that the average value of the samples is 2 ppm or less. Surface soil samples shall be collected from approximately the top 1 inch of soil.

Stream Sediments

The selected alternative shall require a cleanup standard of 1 ppm PCBs for stream sediments and stream banks along North Valley Creek, Hollow Creek, and Cedar Hollow Creek (all tributaries to Little Valley Creek) and Little Valley and Valley Creeks. Contaminated sediment shall be returned to the rail yard and treated using the stabilization/solidification process.

The Commonwealth of Pennsylvania and Federal governmental agencies believe that the concentration and location of PCB contaminated stream sediments as identified in the RI/RA and FS reports may change over time due to sediment transport and other factors. Additional baseline stream corridor sampling for PCBs shall be required prior to implementation of the remedy to better define areas to be remediated. Historical hydrographs and sediment transport studies shall be developed on an ongoing basis to measure the effectiveness of the interim remediation. Specific sampling locations shall be determined during remedial design.

Limited excavation of stream sediments and stream banks shall begin as soon as practicable following issuance of the ROD using the following approach. Stream areas exceeding 10 ppm shall be excavated as soon as practicable and natural deposition areas shall be identified and excavated on a regular basis as a means of implementing the remedy and achieving the 1 ppm cleanup standard. The exact location of natural deposition areas and areas exceeding 10 ppm shall be determined during remedial design. These areas of natural deposition shall be monitored periodically for PCB levels and cleaned on a semi-annual basis or more frequently based on the stream monitoring results, rainfall events, and prediction of sediment deposition. The excavation of stream areas and periodic removal of sediment from natural deposition areas shall be designed to minimize environmental damage and utilize, to the maximum extent practicable, excavation methods such as vacuum dredging or other alternative excavation methods.

After a period of five years following start of construction and, upon approval by EPA in consultation with the Commonwealth of Pennsylvania, stream segments exceeding the 1 ppm cleanup standard shall be considered for excavation. The determination whether excavation shall be required will be based on a review of PCB monitoring data, the expected environmental impact of excavation, determination of the efficiency of the natural stream deposition areas, and other site related factors such as sediment transport of PCBs.

Implementation of the remedy may result in unavoidable impacts and disturbance of the stream(s) and surrounding resource areas due to stream sediment excavation and construction of access roads. Such impacts may include the destruction of natural vegetation and trees, and the loss of plant and aquatic organisms. Impacts to the stream(s) and surrounding area shall be mitigated as described below.

During implementation of the remedy, steps shall be taken to minimize the destruction, loss, and degradation of natural habitat and to minimize habitat alterations in the stream channels and riparian zones. A restoration program will be implemented upon completion of the remedial activities in areas adversely impacted by the remedial action and ancillary activities. In particular, a less destructive method of stream excavation such as vacuum dredging shall be considered to the maximum extent practicable. Any wetland areas impacted by sediment removal and/or associated activities shall be restored and/or enhanced, to the maximum extent practicable.

The restoration program shall be developed in detail during remedial design of the selected remedy. This program shall identify the factors which are key to a successful restoration program. Factors shall include, but are not limited to, replacing and regrading soils and vegetative re-establishment. The restoration program shall include monitoring requirements to determine the success of the restoration. Periodic maintenance (i.e. planting) may also be necessary to ensure final restoration.

The need for continuing stream sediment monitoring and additional stream corridor restoration will be evaluated during the 5-year site reviews under Section 121(c) of CERCLA to monitor the effectiveness of the remedy.

XI. STATUTORY DETERMINATIONS

EPA's primary responsibility at Superfund sites is to select remedial actions that are protective of human health and the environment. Section 121 of CERCLA also requires that the selected remedial action comply with ARARs, be cost-effective, and utilize permanent treatment technologies to the maximum extent practicable. The following sections discuss how the selected remedies meet these statutory requirements.

A. Protection of Human Health and Environment

Based on the baseline risk assessment conducted by EPA, the principal threat within the study area is PCBs. PCBs were detected in Rail Yard soil, buildings, structures, residential soils, stream sediments, and fish. Ground water sampling results for PCBs were reported as laboratory values less than the reliable detection limit but possibly greater than zero. These values are below the quantification limit which is the lowest level at which a chemical can be accurately quantified. PCBs were reported below the level of quantification in wells containing fuel oil, probably due to cross contamination with the fuel oil which is known to mobilize PCBs. Lack of quantifiable presence of PCBs in ground water plus the likelihood of removing fuel oil that may mobilize PCBs should effectively protect ground water from increased PCB contamination. Fuel oil which previously leaked into the ground on-site has resulted in elevated levels of BTEX compounds on -site. Benzene has been detected at concentration in ground water that exceeds the MCL concentration.

The selected remedies are protective of human health and the environment for the five study areas described in the ROD. The source control remedies for Rail Yard soils and residential soils requiring excavation and treatment using stabilization and solidification will prevent exposure to PCBs through inhalation, ingestion, and dermal contact. A risk level of approximately 10[-5] for PCBs will be obtained for residential soils and rail yard soils. The solidification/ stabilization process for both rail yard and residential soils will be conducted in accordance with the following: the Toxic Substances Control Act (TSCA) of 1976, Subpart B - Manufacturing, Processing, Distribution in Commerce, and Use of PCBs and PCB Items, 40 C.F.R. S 761.20(c); TSCA Disposal Requirements, 40 C.F.R. S 761.60(a)(2)(iii); TSCA Chemical Waste Landfill, 40 C.F.R. S 761.75, with the exception of those management controls which are waived under CERCLA S 121(d)(4); the Pennsylvania Erosion Control Regulations, 25 PA Code SS 102.1 -102.5, 102.11-102.13, 102.22- 102.24; and the Pennsylvania Air Pollution Control Act, 25 PA Code SS 123.1, 123.2, 123.41, 127.1, 127.12 and 127.14.

The ground water treatment and fuel oil extraction program shall reduce levels of benzene in the ground water to the MCL level of 5 ug/l as required by the Safe Drinking Water Act, 42 U.S.C. SS 300(f) - 300(j) and 40 C.F.R. S 141.61 or the background concentrations of benzene (the Pennsylvania ARAR under 25 PA Code SS 264.90-262.100), 264.97(i), (j) and 264.100(a)(9)), whichever is more stringent, and shall protect human health and the environment by treating benzene and by removing fuel oil to prevent mobilization of PCBs into the ground water. To the extent that the MCLs are the ARAR, compliance with requirements set forth at 25 PA Code Chapter 109, specifically SS 109.1-109.4 and 109.202 promulgated pursuant to the Pennsylvania Safe Drinking Water Act, (35 P.S. SS 721.721.17), shall be required.

Rail yard building and structures will be decontaminated to attain ARARs the extent necessary to meet the TSCA disposal requirements at 40 C.F.R. S 761.60.

Excavation of stream sediments will reduce aquatic toxicity and bioconcentration of PCBs through exposure to contaminated sediment or through consumption of aquatic organisms. Environmental damage which may occur during stream sediment excavation will be mitigated through a restoration program. All stream remediation will be conducted in accordance with the following to the extent applicable or relevant and appropriate: the Fish and Wildlife Coordination Act, 16 U.S.C. SS 661 et seq.; the Endangered Species Act of 1973, 16 U.S.C. SS 651 et seq.; the Pennsylvania Erosion Control Regulations, 25 PA Code SS 102.1

-102.5, 102.11-102.13, 102.22- 102.24; the Pennsylvania Dam Safety and Encroachments Act of 1978, P.L. 1375, as amended, 32 P.S. SS 693.1 et seq. and the Pennsylvania Dam Safety and Waterway Management Regulations, 25 PA Code SS 105.104, 105.106, 105.111, 105.121; the Pennsylvania Clean Streams Law, 35 P.S. SS 691.1 to 691.1001 and the National Pollution Discharge Elimination System, 25 PA Code 92 and the Pennsylvania Water Quality Standards, 25 PA Code 93.

Implementation of the selected alternative will not pose any unacceptable short-term risks or cross-media impacts to the Site or the community.

B. Attainment of Applicable or Relevant and Appropriate Requirements of Environmental Laws

EPA is invoking a waiver under CERCLA S 121(d)(4) for certain landfill requirements as required by TSCA, 40 C.F.R. S 761.75 and as previously discussed under the Description of Alternatives. All other ARARs will be met by the selected remedy.

A requirement under environmental laws may either be "applicable" or "relevant and appropriate" but not both. Therefore, ARARs are identified based on a two part analysis. First, a determination is made as to whether or not a requirement is applicable; then, if it is not applicable, a determination is made whether it is nevertheless both relevant and appropriate.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

Relevant and appropriate requirements are those cleanup standards of control and other substantive environmental protection requirements, criteria, or other limitations promulgated under federal or state law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site, that their use is well suited to the particular site.

To Be Considered Material. (TBCs) are non-promulgated advisories or guidance issued by federal or state governments that are not legally binding and do not have the stature of ARARs. However, in many circumstances, TBCs can be considered along with ARARs as part of the risk assessment and may be used in determining the necessary level of cleanup or protection to human health or the environment.

There are three types of ARARs considered in the FS. These three types are chemical-specific, action-specific, and location-specific ARARs.

<u>1. Chemical Specific ARARs</u>

Chemical specific ARARs are health or risk based numerical values, which, when applied to Site specific conditions, result in the establishment of numerical values which designate the amount of concentration of a chemical that may be acceptable in the media of interest. The following are chemical-specific ARARs for the Site:

- Safe Drinking Water Act 42 U.S.C. SS 300f - 300j; and 40 C.F.R. Part 141.61 pertaining to maximum contaminant levels for groundwater;

- Pennsylvania Hazardous Waste Management Regulations, 25 PA Code SS 264.90-264.100, specifically SS 264.97(i), (j) and 264.100(a)(9) pertaining to remediation of groundwater to background;

- Pennsylvania Safe Drinking Water Act, 35 P.S. SS 721.721.17; and 25 PA Code Chapter 109, SS 109.1-109.4 and SS 109.201, 109.202 pertaining to maximum contaminant levels for drinking water supplies;

The selected remedy shall be designed to achieve compliance with the chemical specific ARARs related to groundwater at the Site. The Safe Drinking Water Act specifies MCLs for drinking water at public water supplies. The MCL for benzene is 5 ug/l.

The Commonwealth of Pennsylvania standards specify that all ground water containing hazardous substances must be remediated to "background" quality pursuant to 25 PA Code 264.90-264.100, and in particular, 25 PA Code 264.97(i), (j), and 264.100(a)(9). The Commonwealth of Pennsylvania also maintains that the requirement to remediate to background is found in other legal authorities. The background level shall be attained as set forth under the description of the selected remedial alternative unless EPA determines that attaining such level is technically impracticable, or such level is otherwise waived under CERCLA S

121(d)(4).

2. Action-Specific ARARs

Action specific ARARs are technology or activity-based requirements or limitations on actions taken with respect to hazardous wastes. Any RCRA hazardous waste generated on-site and transported off-site for treatment, storage or disposal should be managed pursuant to RCRA Subtitle C, 40 C.F.R. Parts 262, Standards Applicable to Generators of Hazardous Waste, 263, Standards Applicable to Transporters of Hazardous Waste, and 264, Regulations and Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities and the Department of Transportation Rules for Hazardous Materials Transport, 49 C.F.R. Parts 107 and 171-179.

The following are action-specific ARARs for the Site. These ARARs would be applicable for recovered fuel oil and any other RCRA characteristic waste generated during the remedial action.

- RCRA Land Disposal Restrictions, 40 C.F.R. Part 268, Subpart D;
- The Toxic Substances Control Act (TSCA) of 1976, 15 U.S.C. SS 2601 to 2671, and regulations thereunder at Subpart B Manufacturing, Processing, Distribution in Commerce, and Use of PCBs and PCB Items, 40 C.F.R. S 761.20(c);
- TSCA Disposal Requirements, 40 C.F.R. S 761.60(a)(2)(iii);
- TSCA Incineration, 40 C.F.R. S 761.70;
- TSCA Chemical Waste Landfill, 40 C.F.R. S 761.75;
- The Pennsylvania Air Pollution Control Act, 25 PA Code SS 123.1, 123.2, 123.41, 127.1; 127.12; and 127.14 pertaining to fugitive dust and particulate emissions during remediation;
- Occupational Health and Safety Act, 29 C.F.R. Parts 1904, 1910, and 1926, 29 U.S.C. SS 653-657, pertaining to worker protection during remediation;
- Safe Drinking Water Act, 42 U.S.C. S 300h(d), [SDWA S 1421]; and 40 C.F.R. Part 144 pertaining to underground injection of fluids.

The selected remedy shall be designed to achieve compliance with the action-specific ARARs related to soils at the Site.

The Occupational Health and Safety ACT (OSHA), 29 C.F.R. Parts 1904, 1910, and 1926, provides occupational safety and health requirements for workers involved in field construction or operation and maintenance activities and is applicable to the selected remedy.

Pennsylvania Solid Waste Disposal Regulations, 25 PA Code SS 260264 are relevant and appropriate to any hazardous waste generated on-site and transported off-site for treatment, storage, or disposal and for design and operation of the on-site containment cell.

The Toxic Substances Control Act (TSCA) of 1976, 15 U.S.C. SS 2601 to 2671, establishes regulations at 40 C.F.R. Part 761 for disposal and storage of PCB-contaminated materials. TSCA is applicable to remediation of PCB contaminated waste where disposal of material contaminated with PCBs at concentrations of 50 ppm or greater occurred after February 17, 1978. TSCA requirements are considered relevant and appropriate regardless of the date of disposal. Any PCB contaminated material taken off-site during remediation must meet applicable TSCA disposal requirements.

The PCB Disposal Requirements promulgated under TSCA are ARARs for rail yard soil because the selected remedy involves treatment and disposal of soils contaminated with PCBs in excess of 50 ppm. Under TSCA, soils contaminated with PCBs may be disposed of in an incinerator, chemical waste landfill, or may be disposed of by an alternate method which is a destruction technology that achieves an equivalent level of performance to incineration [40 C.F.R. S 761.60(a)(4) and 761.60(e)].

The Regional Administrator is exercising the waiver authority of CERCLA S 121(d)(4), 42 U.S.C. S 9621(d)(4), and the National Contingency Plan (NCP), S 300.430(f)(1)(ii)(C), and is waiving certain requirements of the TSCA chemical waste landfill. The Regional Administrator hereby determines that, for the following reasons, the requirements of 40 C.F.R. 761.75 (b)(1), (2), (3) and (7) are not necessary to protect human health or the environment from PCBs, and that the recommended alternative will attain a standard of performance that is equivalent to that required under TSCA standards and regulations. These ARARs are waived for the following reasons. In this case, placement of treated solidified soil in a containment cell with impermeable cap to minimize infiltration, ground water monitoring in the immediate vicinity of the containment cell [(40 C.F.R. S 761.75(b)(6)], and compliance with performance standards and other ARARS in the ROD will satisfy the requirements of a chemical waste landfill, thereby allowing for a CERCLA S 121(d)(4) waiver.

The requirement for a synthetic membrane liner and leachate collection system is waived because there is no hydraulic connection between the solidified mass and the ground water or surface water, and because the performance standard for the solidified treated soil will require a hydraulic conductivity of 10[-7] cm/sec, equivalent to that required by a synthetic membrane liner, and will minimize leaching of PCBs from the solidified material. The water table is 35 to 50 feet below the ground surface, and infiltration of PCBs to the ground water will be prevented by binding the PCBs in a solidified mass, and by implementing a ground water monitoring program on a long-term basis to detect any leaching of PCBs. The lack of quantifiable levels of PCBs in ground water plus the likelihood of removing the fuel oil that may mobilize PCBs should effectively protect ground water from increased PCB contamination.

The hydrologic requirement that the landfill must be fifty feet above the historic high water table is waived because it is extremely unlikely that the solidified soils will ever come in contact with the ground water since the ground water is 35 to 50 feet below the ground surface and the permeability of the natural soil is in the range of 10[-5] to 10[-6] cm/sec as reported in the FS. The rail yard is not within a 100-year flood plain.

In addition, with regard to fuel oil contaminated soil, the area is contained with an asphalt cover, is currently being remediated by a ground water and fuel oil recovery system, and is located at depths of 20 feet or more so as to make excavation technically impracticable.

These factors ensure that at this Site there will not be an unreasonable risk of injury to health and the environment by waiving the above requirements.

3. Location Specific ARARs

Location-specific ARARs are restrictions placed on the concentration of hazardous substances solely because they occur in a special location. The following are location-specific ARARs for the Site:

- The Fish and Wildlife Coordination Act, 16 U.S.C. S 661 et seq.;
- The Endangered Species Act of 1973, 16 U.S.C. S 1651 et seq.;
- The Pennsylvania Erosion Control Regulations, 25 PA Code SS 102.1-102.5, SS 102.11-102.13, and SS 102.22-102.24;
- The Pennsylvania Dam Safety and Encroachments Act of 1978, P.L. 1375, as amended, 32 P.S. SS 693.1 et seq.; and the Pennsylvania Dam Safety and Waterway Management Regulations, 25 PA Code Chapt. SS 105.1 et seq., pertaining to wetlands permitting;
- The Pennsylvania Clean Streams Law, 35 P.S. SS 691.1 to 691.1001; and the National Pollution Discharge Regulations at 25 PA Code 92 pertaining to point source discharges to streams, wetlands permitting; and 25 PA Code 93 pertaining to Water Quality Standards for discharge to streams;
- 25 PA Code S 269(b)(1) and (2) describes requirements for building a facility within a protected river corridor.
- The Clean Water Act, 33 U.S.C. S 1344; and 33 C.F.R. Part 330 pertaining to permitting of wetlands;

The selected remedy shall be designed to achieve location-specific ARARs for the Site.

The Fish and Wildlife Coordination Act, 16 USC S 661 et. seq., enacted to protect fish and wildlife due to the control or structural modification of a natural stream or body of water, is relevant and appropriate to stream sediment remediation.

The Endangered Species Act of 1973, 16 USC S 1651 et. seq., provides a means for conserving various species of fish, wildlife, and plants that are threatened with extinction. The Endangered Species Act will be applicable if a determination is made that endangered species are present or will be affected by the remedial alternative.

The Pennsylvania Erosion Control Regulations, 25 PA Code Chapter SS 102.1-102.5, 102.11-102.13, 102.22-102.24, regulate erosion and sedimentation control. These regulations are applicable to the regrading and excavation activities associated with the selected remedial alternative at the rail yard and in the residential areas.

The Pennsylvania Dam Safety and Encroachments Act, Act of 1978, P.L. 1375, as amended, 32 P.S. SS 693.1 et seq. and the Pennsylvania Dam Safety and Waterway Management Regulation, Chapter 105, 25 PA Code SS 105.1 et. seq. apply to stream relocation and any other stream encroachments and to wetland protection.

4. To-Be-Considered (TBC)

To-Be-Considereds are non-promulgated advisories or guidance issued by Federal or State government that are not legally binding and do not have the status of potential ARARs. However, in many circumstances, TBCs will be considered along with ARARs as part of the Site risk assessment and may be used in determining the necessary level of cleanup for protection of health or the environment. The following are TBCs for the Site:

- "CERCLA Compliance with Other Laws" Manual (EPA/540/G89/006;
- "Guidance on Remedial Actions for Superfund Sites with PCB Contamination," US EPA, OSWER Directive: 9355.4-01FS, Office of Emergency and Remedial Response Hazardous Site Control Division (OS-220), August 1990;
- The Toxic Substances Control Act, Part 761, Subpart G, PCB Spill Cleanup Policy, 40 C.F.R. S 761.120;
- "A Guide to Selecting Superfund Remedial Actions," US EPA, OSWER Directive: 9355.0-27FS, Office of Emergency and Remedial Response Hazardous Site Control Division OS-220, April 1990;
- Executive Order 11988, 40 C.F.R. S 6, Appendix A, concerning Federal wetlands policies.

In order to assist in the identification and assessment of ARARs, EPA has developed the "CERCLA Compliance with Other Laws" Manual (EPA/540/G-89/006). In addition, EPA has issued OSWER Directive No. 9355.4-01, August 1990, "Guidance on Remedial Actions for Superfund Sites with PCB Contamination" (PCB Guidance Document). The PCB Guidance Document identifies potential ARARs and TBC criteria pertinent to CERCLA sites with PCB contamination and addresses their integration into the RI/FS and remedy selection process.

The TSCA PCB Spill Cleanup Policy [40 CFR S 761.60(d)] addresses improper disposal of PCBs as intentional (as well as unintentional) spill, leaks, and other uncontrolled discharges of PCBs at concentrations of 50 ppm or greater. While the TSCA PCB spill cleanup policy is not a potential ARAR, it does identify cleanup standards and is a TBC. These guidelines are to be applied on a case-by-case basis. For example, the selected remedy identifies a cleanup standard of 10 ug/100cm[2] for PCB contaminated surface areas in the rail yard car shop building based on the Spill Cleanup Policy. EPA does not believe, however, that the spill cleanup policy standards for remediation of residential soils which requires remediation to 10 ppm with a 10 inch soil cover will adequately protect human health and the environment and has recommended lower cleanup standards in the ROD based on EPA's risk assessment for the Site.

C. Cost Effectiveness

The selected remedy is cost-effective in providing overall protection in proportion to cost, and meets all other requirements of CERCLA. The NCP, 40 CFR SS 300.430(f)(ii)(D), requires EPA to evaluate cost-effectiveness by comparing all the alternatives which meet the threshold criteria - protection of human health and environment and compliance with ARARs - against three additional balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; and short-term effectiveness. The selected remedy meets these criteria and provides for overall effectiveness in proportion to its cost.

The estimated present worth cost for all the selected remedies is $28,268,000. A cost estimate is presented in Table 4. Excavation and treatment of quantities of soil and sediments different than the quantities estimated in the FS will change the present worth cost proportionately.

D. Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the selected remedies represent the maximum extent to which permanent solutions and treatment technologies can be utilized while providing the best balance among the other evaluation criteria. Of those alternatives evaluated that are protective of human health and the environment and meet ARARs, the selected remedies provide the best balance with regard to long-term and short-term effectiveness and permanence, cost, implementability, reduction in toxicity, mobility, or volume through treatment, State and community acceptance, and preference for treatment as a principal element.

Stabilization/solidification of contaminated soils and sediments is a treatment technology which permanently reduces the mobility of PCBs through immobilization and physical encapsulation. Although the selected alternatives do not provide as great a degree of reduction of toxicity and mobility as the incineration and KPEG technologies, stabilization/solidification will reduce the risks associated with direct contact with PCBs to a greater degree than containment only. The selection of treatment rather than containment of PCB-contaminated soil and sediment is consistent with Superfund program policy for wastes that represent a principal threat at the Site.

The ground water treatment system will provide for recovery of fuel oil and treatment of ground water to the maximum extent practicable. Decontamination of rail yard buildings and structures will effectively provide treatment of all contaminated surface areas that pose a direct threat to human health.

E. Preference for Treatment as a Principal Element

The selected remedies satisfy the statutory preference for treatment as a principal element.

XII. DOCUMENTATION OF SIGNIFICANT CHANGES

The following significant changes have been made to the Selected Remedies from the preferred alternative described in the Proposed Plan.

1) The selected alternative for remediation of rail yard soils has been clarified to indicate that additional treatability studies will be conducted. The reasons for requiring additional treatability studies are discussed in the ROD. The cost of remediation of rail yard soil has been increased by $3,240,000 to construct a containment cell. This cost is based on comments received from the PRPs and was not included in the FS cost estimate.

2) The selected alternative for remediation of rail yard soils has been clarified to indicate that fuel oil soils will not be excavated as long as the ground water and fuel oil recovery systems are effectively operated and impermeable asphalt cover remains in place as described in the ROD.

3) The selected alternative for remediation of stream sediments will require additional stream monitoring and less extensive excavation to achieve the 1 ppm cleanup standard. This change was made in response to several comments received by the Agency.

Table 1

Summary of PCB Concentration for Selected Media Locations

Location	Range of Detected PCB Concentration[1]	Cleanup Standard
Rail Yard Soil	0.84 - 6000 ppm	25 ppm
Residential Soil	0.15 - 21 ppm	2 ppm
Carshop Indoor Surfaces	0.6 - 823 ug/100 cm[2]	10 ug/100 cm[2]
Stream Sediments in Tributaries		
North Valley Road	0.11 - 5.0 ppm	1 ppm
Cedar Hollow Road	1.3 - 28 ppm	1 ppm
Hollow Road	1.3 - 190 ppm	1 ppm

1 Reported as Arachlor 1260

Table 2

Key Risk Terms

Carcinogen: A substance that increases the incidence of cancer.

Chronic Daily Intake (CDI): The average amount of a chemical in contact with an individual on a daily basis over a substantial portion of a lifetime.

Chronic Exposure: A persistent, recurring, or long-term exposure. Chronic exposure may result in health effects (such as cancer) that are delayed in onset, occurring long after exposure ceased.

Exposure: The opportunity to receive a dose through direct contact with a chemical or medium containing a chemical.

Exposure Assessment: The process of describing, for a population at risk, the amounts of chemicals to which individuals are exposed, or the distribution of exposures within a population, or the average exposure of an entire population.

Hazard Index: An EPA method used to assess the potential noncarcinogenic risk. The ratio of the CDI to the chronic RfD (or other suitable toxicity value for noncarcinogens) is calculated. If it is less than one, then the exposure represented by the CDI is judged unlikely to produce an adverse noncarcinogenic effect. A cumulative, endpoint-specific HI can also be calculated to evaluate the risks posed by exposure to more than one chemical by summing the CDI RfD ratios for all the chemicals of interest exert a similar effect on a particular organ. This approach assumes that multiple subthreshold exposures could result in an adverse effect on a particular organ and that the magnitude of the adverse effect will be proportional to the sum of the ratios of the subthreshold exposures. If the cumulative HI is greater, than one, then there may be concern for public health risk.

Reference Dose (RfD): The EPA's preferred toxicity value for evaluating noncarcinogenic effects.

Risk: The nature and probability of occurrence of an unwanted, adverse effect on human life or health, or on the environment.

Risk Assessment: The characterization of the potential adverse effect on human life or health, or on the environment. According to the National Research Council's Committee on the institutional Means for Assessment of Health Risk, human health risk assessment includes: description on the potential adverse health effects based on an evaluation of results of epidemiologic, clinical, toxicologic, and environmental research; extrapolation from those results to predict the types and estimate the extent of health effects humans under given conditions of exposure; judgements as to the number and characteristics of persons exposed at various intensities and durations; summary judgements on the existence and overall magnitude of the public-health program; and characterization of the uncertainties inherent in the process of inferring risk.

Slope Factor: The statistical 95% upper confidence limit on the slope of the dose response relationship at low doses for a carcinogen. Values can range from about 0.0001 to about 100.000, in units of lifetime risk per unit dose (mg/kg-day). The larger the value, the more potent is the carcinogen, i.e., a smaller dose is sufficient to increase the risk of cancer.

Table 3

Parameters Used in Exposure Calculations

Parameter Consumption	Soil Ingestion Rail Yard	Soil Ingestion Residential	Fish
	Exposure Scenario		
(1) Amount of soil ingested or fish consumed	50 mg/day	100 mg/day (adult) 200 mg/day (child)	0.054 Kg/meal
(2) Percent Absorbed	100%	100%	50%
(3) Body Weight	70 Kg	70 Kg (adult) 15 Kg (child)	70 Kg
(4) Exposure Frequency	250 days/yr	350 days/yr	350 days/yr
(5) Exposure Duration (years/lifetime)	25	24 (adult) 6 (child)	30

Table 4 Cost Summary

	Capital	Annual O&M	Present Worth
Rail Yard Soil	$18,204,275	$138,250	$19,507,375
Residential Soil[2]	$1,196,000	-0-	$1,196,000
Building & Structures	$260,000	$235,950[1]	$731,905
GW & Fuel Oil Treatment	-0-	$120,000	$1,131,120
Stream/Sediments[2]	$5,701,720	-0-	$5,701,720

1 Cost of implementing worker protection program for 2 years until rail yard closes.
2 Based on FS estimate.